Survey of Income and Program Participation

MEASURING THE BIAS IN GROSS FLOWS IN THE
PRESENCE OF AUTO-CORRELATED RESPONSE ERRORS

BY

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TABLE OF CONTENTS

I. INTRODUCTION

Frequently, a categorical variable will be observed at two or more points in time. The interior cells of the cross-classification of two observations are commonly referred to as gross flows or gross changes. Gross flow estimates are potentially of tremendous value in understanding processes. However, estimates are subject to very complex nonsampling errors that have discouraged their use.[1] In fact, the concept may be fundamentally unmeasureable in the sense that any attempt to measure gross flows may change the characteristics of the process.[2] The most serious problems usually present are mismatched observations, observations not missing at random, and misclassification in the observations. In this paper, we focus on misclassifications for dichotomous variables. To the best of our knowledge, prior work on the effect of misclassifications has assumed that misclassifications on the two observations are independent. We have developed a technique that takes advantage of the design of the Survey of Income and Program Participation (SIPP) to estimate the effect in the presence of auto-correlated errors. Even though not all requirements for the technique are currently met by SIPP design, we did try applying it.

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1 For an excellent overview of the history of the problem, see the proceedings of the recent conference [8].

2 Parnes [2] first formulated a type of uncertainty principle in this area. A good example is participation in government programs. Respondents may learn of these at the first contact and avail themselves of the benefit by the second contact.

In Section II, we present a summary of the technique and the exploratory application. In Section III, we make recommendations for design changes in SIPP and indicate areas for future study. In Section IV, we discuss the technique in detail. In Section V, we present the application.

II. SUMMARY

Several features of the SIPP design are essential to the technique.[3] First, the reference period covers more than one point in time. (The SIPP reference period is four months for most variables.) Second, interviewing is staggered over several points in time (four months); i.e. one fourth of the sample is interviewed each month. Third, each person is interviewed repeatedly with each reference period immediately following the preceding period; i.e. there are no gaps. Taken together, these features imply that there are four measurements of the gross flows between any pair of consecutive months. (See Figure 1.)

Figure 1. Time in Sample by Rotation and Reference Month

Reference Month	Rotation 1	2	3	4
February	3	2	2	2
March	3	3	2	2
April	3	3	3	2
May	3	3	3	3
June	4	3	3	3
July	4	4	3	3

Example: Gross flows between April and May are observed from the third interview for rotations 1, 2, and 3. For rotation 4, they are observed by matching the second and third interviews.

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[3] For an overview of SIPP, see [7].

Three of the measurements come from single interviews (the gross flows are within a single reference period), while one measurement comes from a pair of consecutive interivews. A final feature that is required but only partially satisfied is a reinterview program to supply corrected gross flows within reference periods. (While there is a SIPP reinterview program, it was not designed with this objective.)

The combination of error rates, dual within/between reference period measurements, corrected within period gross flows, and a few extra assumptions, would allow us to get a rough feeling for the correlation between measurement errors for consecutive months when the measurements are taken four months apart. If we could get that far, there is some reason to hope that the correlation would be similar for nonconsecutive months when measurements are taken four or more months apart. Given the error rates and the correlation, the bias in the gross flows would then be estimable.

This technique is admittedly weak. Only the intensity of interest in gross flows and the comparable weakness of known alternatives induced us to present it. Its greatest weakness is the requirement for a rigorous reinterview program to produce accurate reinterview data on gross flows within periods. Current survey reinterview programs are most effective at detecting curbstoning (interviewer fraud). Beyond that, they are notoriously unreliable.[4] Note, however, that we do not require the common assumption that the reinterview be independent of the original interview.[5] Nor do we require multiple reinterviews of the same respondent as has been recommended as a technique for dealing with correlated misclassifications.[6] (Field staff is generally strongly opposed to multiple reinterview contacts.)

The alternative to reinterview data is administrative data. It is not clear whether the record-matching problems there will be much less severe than the problems with reinterview data. Besides, the number of variables for which administrative data exist is very limited.

Faced then with this dilemma, we decided to forge ahead, making whatever assumptions were required, in order to get some feeling for the magnitude of the bias in estimated gross flows from SIPP. We are, of course, aware that our estimates are extremely crude; we only hope that they will be viewed as being at least marginally useful in understanding a very difficult and pressing problem.

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4 A general description of reinterview as conducted at the Bureau is given in [3]. An internal critique is given in [4]. The results of an experiment with independent reconciliation are given in [5]. Design modifications are given in [6].

5 See, for example, Fuller and Chua in [8] pp. 65-77.

6 Recommendation number 3 on page 135 of [8].

Due to the lack of reliable data including the reinterview data, we were forced to restrict the scope of our analysis to the characteristic of food stamps. Even that was in the form of a sensitivity analysis. Varying the parameters (error rates, etc.) used in the technique was necessary to assess the robustness of our results. Our analysis showed the results to be fairly robust. For almost all combinations of the parameter values, the bias in the gross flow estimates appears to be quite serious.

III. RECOMMENDATIONS AND FUTURE STUDY

We have demonstrated that the user of these estimates is taking a serious risk. Estimates of exit and entrance rates (defined in Section IV) might easily be substantially biased. It is thus clear that further and better research is urgently needed. We outline some avenues for future study below and welcome additional suggestions. Unfortunately, this research will take time. Meanwhile, data users require some guidance. Our only suggestion at this point is that users examine the ratios of month-to-month exit and entrance rates as observed between reference periods to those observed within reference periods. For those characteristics with large ratios, statements about gross flows over longer periods should be very tentative.

Perhaps we should focus more on how gross flows change over time than on the gross flows themselves. (This is done, for example, with CPS income estimates.) Note, however, that this requires stable instruments, procedures, and interviewing staff; so far, SIPP has changed a fair amount from panel to panel.

Areas for possible future study:

- Redesign reinterview program. Emphasize estimation of monthly error rates. Also, explore procedures other than simple repetition of original questions.
- Match SIPP into administrative databases. For some characteristics, obtain biases in gross flows directly. For others, obtain error rates for use in the technique proposed in this paper.
- Select special samples with known longitudinal characteristics from lists of program recipients, employees, tax-payers, etc.
- Subjectively examine gross flows to see if they "make sense."
- Explore reference periods of different lengths.
- Explore methods for increasing correlations between subsequent interviews such as conditioning response with a reminder of past response or longitudinal reconciliation.
- Explore the applicability of Colm O'Muircheartaigh's work on the correlation between interview and reinterview.

IV. DETAILED DESCRIPTION OF METHOD

Consider a Bernoulli variable observed at two points in time on one sample of a population. Assuming that the population is held constant, each unit can have one of four joint time statuses: (1,1), (1,0), (0,1), or (0,0). We will refer to these as flow types 1, 2, 3, and 4 respectively. Let $T=(T_1,...,T_4)^T$ denote the population mean vector for the four gross flows. Let $Y=(Y_1,...,Y_4)^T$ denote the vector of observed mean gross flows from the sample. We will assume that any undercoverage or nonresponse in the sample is ignorable and that the observations are perfectly matched. Thus the bias EY−T in the observed gross flows is due solely to misclassification. Let m_{ij}=Pr{unit of flow type j is observed as flow type i} for i=1,...,4 and j=1,...,4. Let $M=((m_{ij}))$ be a 4×4 matrix. It is then easy to show that EY=MT. Our general idea is to estimate M and then estimate the bias as

$$\widehat{\text{bias}} = Y-\hat{M}^{-1}Y = (I-\hat{M}^{-1})Y, \qquad (1)$$

where I is the 4×4 identity matrix.

Of course, estimating M is extremely difficult. Furthermore, there is evidence that M varies strongly by characteristic and by whether the gross flows are observed within a period or between periods.[7] However, there is some reason to hope that M is fairly stable by characteristic for gross flows observed between periods but over varying time periods. This hope is based on heuristic arguments. If M does vary over time (between periods), it could be due to changing error rates or changing correlations between the errors. While the error rates do probably fluctuate from period to period, there is little reason to think that a trend would exist. As for the correlations, any correlation is probably more due to having the same poorly informed proxy respondent, the same poorly performing interviewer, or the same respondent misunderstanding of concepts, rather than active memory of response from the prior period. Thus while the correlations probably do weaken with increased time, the weakening may be rather slow.

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7 See [1] for a comparison of within a period and between period gross flows.

So we assume that an estimate of M for a pair of consecutive months observed between periods is still a reasonable estimate for a pair of months, for example, separated by 11 months. (A great deal of interest focuses on gross flows from a month to a year later.) Fortunately, estimating M for a pair of consecutive months is easier.

Let $C_1,\ldots,C_4$ be error rates for the four flow types at time 1 and $C_5,\ldots,C_8$ be error rates for the four flow types at time 2. (C_1 and C_2 are false negative rates at time 1 for flow groups 1 and 2. They are allowed to be different since we think that stable units may have a different rate than those actually experiencing a transition. The overall false negative rate at time 1 is $(T_1C_1+T_2C_2)/(T_1+T_2)$. C_3 and C_4 are false positive rates at time 1, C_5 and C_7 are false negative rates at time 2, and C_6 and C_8 are false positive rates at time 2.) Also, let $C_9,\ldots,C_{12}$ be the conditional probabilities of error at time 2 given error at time 1 for the four flow types. It is then fairly easy to show that

$$M = \begin{bmatrix} 1-C_1-C_5+C_1C_9 & C_6-C_2C_{10} & C_3(1-C_{11}) & C_4C_{12} \\ C_5-C_1C_9 & 1-C_2-C_6+C_2C_{10} & C_3C_{11} & C_4(1-C_{12}) \\ C_1(1-C_9) & C_2C_{10} & 1-C_3-C_7+C_3C_{11} & C_8-C_4C_{12} \\ C_1C_9 & C_2(1-C_{10}) & C_7-C_3C_{11} & 1-C_4-C_8+C_4C_{12} \end{bmatrix}$$

Using the reinterview, C_1 through C_8 may be directly estimated. Also, the reinterview provides an improved estimate Y_R of the gross flows. The problem is thus reduced to finding C_9 through C_{12} such that

$$MY_R = Y_B, \tag{2}$$

where Y_B is the vector of observed gross flows between periods for the same pair of consecutive months. Unfortunately, the existence of a solution to (2) is quite rare.

We only sketch the proof of this assertion, leaving the details to the reader.

Letting $X = [1, -1, -1, 1]^T$, we may write M as

$$M = X[C_1C_9 \quad -C_2C_{10} \quad -C_3C_{11} \quad C_4C_{12}] + A,$$

where A does not depend on C_9 through C_{12}. Then (2) has a solution if, and only if, Y_B-AY_R is a multiple of X. While least square solutions do exist, there is no unique solution. (Any $(C_9,...,C_{12})$ such that $(M-A)Y_R$ is the projection of Y_B-AY_R onto X is a least squares solution.)

Thinking this over, we realized that we had insufficient data to estimate the error correlation for each flow type separately. Somehow, it is necessary to define a measure of association that would apply simultaneously to the four flow types.

We came up with the idea that $(C_9,...,C_{12})^T$ should lie on the line between the points $(1,0,0,1)^T$ and $(C_5,...,C_8)^T$. We then defined the measure of association r to be the ratio of the Euclidean distance between $(C_9,...,C_{12})^T$ and $(C_5,...,C_8)^T$ to that between $(1,0,0,1)^T$ and $(C_5,...,C_8)^T$. This has some intuitive appeal since if r=0, then $(C_9,...,C_{12})^T = (C_5,...,C_8)^T$, which implies that errors occur independently. On the other hand, if r=1, then $(C_9,...,C_{12})^T = (1,0,0,1)^T$, which implies strong dependence on errors. For example, it implies a correlation of 1.0 among flow types 1 and 4 (the no change categories) provided that the error rates are equal at time 1 and time 2, and it implies a strong negative correlation among flow types 2 and 3 (the with change categories). Another way of conceptualizing r=1 is: if an error is made at the first observation, then the same response will be obtained at the second observation regardless of the flow type of the unit. With some algebra, we obtain the value of r that minimizes $\|MY_R - Y_B\|^2$:

$$r = \frac{X^T(Y_B - AY_R) - 4\begin{bmatrix} C_1C_5 & -C_2C_6 & -C_3C_7 & C_4C_8 \end{bmatrix} Y_R}{4\begin{bmatrix} C_1(1-C_5) & C_2C_6 & C_3C_7 & C_4(1-C_8) \end{bmatrix} Y_R} \qquad (3)$$

To summarize, our technique is to estimate C_1 through C_8 and Y_R from reinterview, then use these with Y_B to estimate r. Using r and linear interpolation, we can estimate C_9 through C_{12}. We can then compute an estimate of M, and apply $(I-\hat{M}^{-1})$ to any observed gross flows between periods to estimate the biases in the gross flows.

This technique also provides estimates of bias in transition rates, the percentages of those with an initial status who change status by the second time point. Let the elements of $\hat{M}^{-1}Y$ be denoted Z_1 through Z_4. Then the biases in the transition rates are

$$\frac{Y_2}{Y_1+Y_2} - \frac{Z_2}{Z_1+Z_2} \quad \text{and} \qquad (4)$$

$$\frac{Y_3}{Y_3+Y_4} - \frac{Z_3}{Z_3+Z_4} \quad . \qquad (5)$$

(4) and (5) are referred to as the bias in the exit and entrance rates, respectively.

V. SENSITIVITY ANALYSIS

Given the uncertainties in the estimation of the error rates and the improved estimate of gross flows discussed in Section II, we believed an appropriate approach to getting an idea of the magnitude of the bias in gross flow estimates from SIPP was to perform sensitivity analysis.

Due to the weakness of the data produced from the SIPP reinterview, we limited our analysis to the gross flow estimates of food stamp program participation. In particular, the unit of analysis was the authorized person of a food stamp unit. (A food stamp unit is all persons covered under an authorized person's allotment.) We focused on food stamps because their error rates seemed more plausible than those of other characteristics.

The main reasons for presenting this analysis of food stamp gross flows is to provide some information on the probable magnitude of biases in gross flow estimates from SIPP and to illustrate the application of the technique. Another reason is to observe how sensitive the biases in gross flow estimates are to changes in the error rates, Y_R, and the year-to-year gross flow estimates. The greater the sensitivity, the less reliable the comparisons of gross flows across demographic groups or across time will be if we do not maintain a high degree of uniformity in SIPP data collection and processing procedures.

Our sensitivity analysis consists of varying the estimate of M for food stamps by varying the values of C_1 through C_8 and Y_R. We then estimate biases by applying $(I-M^{-1})$ to observed food stamp gross flows between periods and evaluate the sensitivity of these biases to the changes in C_1 through C_8 and Y_R. For this analysis, we studied observed year-to-year food stamp gross flows because of interest expressed in the production of statistics based on year-to-year gross flow estimates from SIPP. As an additional part of our sensitivity analysis, we varied the year-to-year gross flow estimates. The purpose was to study the reliability of comparisons of gross flow estimates across demographic groups or across time.

In our presentation of the sensitivity analysis of the bias in gross flow estimates for food stamps, we first describe the estimation of parameters needed to apply the technique. We then discuss how these parameters were varied to perform the sensitivity analysis. Finally, we present the results.

A. Estimation of Parameters for Food Stamps

Error rates, an improved estimate of consecutive month-to-month gross flows, and observed gross flows must be estimated to apply the technique. Observed food stamp gross flow estimates are readily available from SIPP data. However, the estimation of error rates and improved gross flow estimates for food stamps is much more subjective. The methodology used to estimate these parameters is discussed below.

1. Error Rates

Several assumptions are required in order to determine the error rates ($C_1,...,C_8$) from the SIPP reinterview. The SIPP reinterview references the entire period--not each month within the period. Thus, we are unable to differentiate time 1 and time 2 error rates based on length of recall. In addition, we are unable to differentiate error rates, for a specific time, based on the flow type. These two limitations forced us to assume $C_1 = C_2 = C_5 = C_7$ and $C_3 = C_4 = C_6 = C_8$. Therefore, the determination of the error rates is reduced to computing two error rates: the probability of falsely observing no food stamps (false negative) and the probability of falsely observing food stamps (false positive).

These error rates were actually computed for food stamps and several other characteristics from the SIPP reinterview. Upon examination of these error rates we immediately questioned their surprisingly small magnitude. We realized that error rates referencing the entire period would most likely be smaller than those that reference a single month, which we would have preferred. To estimate the magnitude of this underestimate we examined AFDC (Aid to Families with Dependent Children) data from ISDP (Income Survey Development Program).[8] The data indicated that the false negative error rate computed from administrative record checks was approximately three times larger than that computed from the SIPP reinterview.

(False positive error rates were unavailable.) Believing the ISDP error rates to be more realistic, we applied a factor of 3 to the food stamp false negative error rate.

In considering the computation of the false positive error rate for food stamps, we realized that the false positive observations were in terms of food stamp units while the true negative observations were in terms of persons 18 and over. To adjust for this we applied a factor of 1.4 (average number of persons 18 and over in a food stamp unit) to the false positive error rate.

Thus, the above assumptions and adjustments provide us with the following estimates of the error rates:

$$\text{False Negative} = C_1 = C_2 = C_5 = C_7 = 0.0597$$

$$\text{False Positive} = C_3 = C_4 = C_6 = C_8 = 0.0034$$

2. Improved Estimate of Gross Flow for Food Stamps

Our intuition tells us that flow types 2 and 3 (the with change categories) are probably overestimated and underestimated by gross flows observed between and within periods, respectively. However, we thought we had a better understanding of the nature of the underestimates in flow types 2 and 3 observed within a period. We intuited that within a period flow types 2 and 3 may be observed as flow

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[8] For a more detailed discussion of AFDC error rates in ISDP, see [9].

types 1 and 4, while flow types 1 and 4 are not as likely to be observed as flow types 2 and 3. This corresponds to r=1 with the error rates for flow types 1 and 4 equal at time 1 and time 2. Thus, an improved estimate of consecutive month-to-month gross flow for food stamps is computed as follows:

$$Y_R = \hat{M}^{-1}_{r=1} Y_w,$$

where Y_w is the vector of observed gross flows within a period. For food stamps,

$$Y_w = [.039867\ .001287\ .001645\ .957202]^T$$

which results in an improved estimate of consecutive month-to-month gross flows

$$Y_R = [.038923\ .001374\ .001756\ .957948]^T$$

B. Varying the Parameters for Food Stamps

Given the subjective nature of the estimation of C_1 through C_8 and Y_R we thought it necessary to study the robustness of the estimated biases to assess their usefulness. To accomplish this we arbitrarily decreased and increased the error rates. We also used different improved estimates, Y_R. One Y_R was a weighted average of the observed gross flows within and between periods. Another Y_R was somewhat arbitrarily computed, so as to have gross flows with change that were closer to the gross flows with change from between periods.

C. Results

It is our understanding that of central interest in the problem of biases in gross flow estimates is the production of transition rates (defined in Section IV). Consequently, our sensitivity analysis results are presented in terms of the biases in the transition rates.

To assess the seriousness of the magnitude of the bias in a transition rate we compared it to an estimate of the standard error of the transition rate. The greater the absolute value of the ratio of bias to standard error is; the more serious, the problem.

Using the observed year-to-year gross flows for food stamps we computed the ratio of bias to standard error of the transition rates for several combinations of error rates and Y_R (Table A).

The rows of Table A are the various error rates used. The first row (original) being the error rates estimated in Section V.A.1. Still concerned about the possible underestimation of the error rates, we used the remaining permutations of doubling the false negative and false positive error rates in rows two through four. Concerned with the assumption that, error rates are the same for all flow types, in particular, the with change categories versus the without change categories, we doubled the error rates for flow types 2 and 3 (the with change categories) in the fifth row. In the opposite direction of the top five rows, we used the unadjusted false negative error rates in the sixth row. (See Figure 2.)

Figure 2. Error Rates by Type of Error and Row

Row	False Negative ($C_1=C_2=C_5=C_7$)	False Positive ($C_3=C_4=C_6=C_8$)
1	.0597	.0034
2	.1194	.0034
3	.0597	.0068
4	.1194	.0068
5	$C_1=C_5=.0597, C_2=C_7=.1194$	$C_3=C_6=.0068, C_4=C_8=.0034$
6	.0199	.0034

The columns of Table A are the three values for Y_R. The first column being our intuited estimate of Y_R, as explained in Section V.A.2. Flow types 2 and 3 of our intuited Y_R are very close to those of the observed gross flows within a period Y_W. The middle column is a weighted average of Y_W (three fourths weight) and the observed gross flows between periods Y_B (one fourth weight), where $Y_B = [.036444\ .005865\ .004461\ .953229]^T$ for food stamps. For the weighted average Y_R, flow types 2 and 3 are larger, but still closer to those of Y_W. Note, respectively, these two columns correspond to month-to-month over-reporting and equivalent-reporting of flow types 2 and 3. The last column corresponds to the other extreme of month-to-month under-reporting of flow types 2 and 3. For this column, flow types 2 and 3 are about in the middle of those for Y_W and Y_B. (See Figure 3.)

Figure 3. Gross Flows by Assumed Y_R and Flow Type

Flow Type	Intuition	Weighted Average	Upper Estimate
1	.038923	.039011	.037954
2	.001374	.002431	.003488
3	.001756	.002349	.002942
4	.957948	.956209	.955616

For each combination of error rate and Y_R in Table A, we computed the ratio of bias to standard error for exit (upper right) and entrance (lower left) rates. For example, the ratios for exits and entrances are 5.13 and 4.85, respectively, for the original error rates and the intuited Y_R (extreme upper left cell). (Detailed results along with a more detailed explanation of the application of the technique to compute these ratios are provided in Appendix A.) The reported year-to-year exit rate is 29.54%. Referring to Table A-11 in Appendix A, the technique estimated the "true" year-to-year exit rate to be 23.23% with a standard error (SE) of 1.23%. This results in a bias to SE ratio of 5.13 ((29.54%-23.23%)/ 1.23%) for exits. Similarly for entrances, the bias to SE ratio is 4.85 ((.978%-.667%)/.064%).

The implications of the magnitude of these ratios are evident. For most applications, a ratio less than .75 is not serious, while a ratio greater than 1.5 is cause for some concern. However, as stated earlier, to assess the robustness of this result, we varied the error rates and Y_R. The results of each combination constitute the remainder of Table A.

In the first column, varying the error rates does affect the ratios to some extent. Still, the magnitude of the ratios is large, even when all the error rates are doubled (row 4): exit ratio=3.26 and entrance ratio=4.07. In the second column (Y_R=Weighted Average) the ratios are smaller than the corresponding ratios in the first column, but all are still large enough for concern. Even for the extreme assumption of Y_R for the third column, the ratios are large except for the exit ratio when the false negative error rate is doubled (Rows 3 and 4). So, for almost every combination of error rate and Y_R in Table A, the magnitude of the bias in the observed year-to-year transition rates relative to the standard error appears to be quite serious.

Another part of our sensitivity analysis was to assess the effect of varying the observed year-to-year gross flow estimates. To accomplish this, we decreased and increased flow types 2 and 3 by 30%. (Note, the sum of flow types 1 and 2 and the sum of flow types 3 and 4 were held constant.) Table B contains the results of the 30% decrease in flow types 2 and 3. (Detailed results are given in Appendix B.) Compared to Table A, all the ratios appear to have increased by at least 50%. Clearly, with these exit and entrance rates, the magnitude of the bias relative to the standard error is very serious for all combinations of error rates and Y_R. Table C contains the results of the 30% increase in flow types 2 and 3. (Detailed results are given in Appendix C.) Comparison of ratios to Table A vary by the assumed Y_R. For columns 1 and 2, almost all (except exit ratios for rows 3 and 4) of the ratios decreased by about 30%, but are still greater than 1. However, for column 3, the absolute value of almost all of the ratios is at the most 1.5, with the smaller ratios coming from the rows with doubled error rates. This means that the magnitude of the bias relative to the standard error is generally not as serious for these certain combinations of increased error rates, Y_R, and year-to-year gross flow estimates. However, these combinations are rather extreme compared to our original combination of error rates, intuited Y_R and observed year-to-year gross flow estimates.

D. Summarization of Results

For the characteristic of food stamps, the ratio of bias to standard error was sensitive to the assumption of Y_R and the year-to-year gross flow estimates and, to a lesser extent, the error rates. The combinations of these variables covered a very large part of the realm of reasonable possibilities. In almost all cases, the magnitude of the ratio indicated a serious bias in observed transition rates. Yet, there were sufficient changes in the ratio to warrant concern about the reliability of comparisons between transition rates if a high degree of uniformity in SIPP data collection and processing procedures is not maintained.

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TABLE A

Ratio of Bias to Standard Error for Observed Year-to-Year Transition Rates for Food Stamps

ERROR RATES	Assumed True Month-to-Month Gross Flows (Y_m): Intuition (Near Within) (1)		Weighted Average (2)		Upper Estimate (Near Between) (3)	
	Ratio for Entrances	Ratio for Exits	Ratio for Entrances	Ratio for Exits	Ratio for Entrances	Ratio for Exits
Original (1)	4.85	5.13	3.38	3.46	2.14	1.95
Double False Negative (2)	4.15	5.33	2.73	3.71	2.30	1.55
Double False Positive (3)	4.94	3.26	3.47	1.55	2.20	-0.04
Double All (4)	4.07	3.26	2.70	1.67	1.54	0.23
Double Both for Flow Types 2 & 3 (5)	4.16	4.22	2.76	2.64	1.57	1.22
One Third of False Negative (6)	5.59	5.33	4.00	3.54	2.63	1.89

Key

	Y_m
ERROR RATE	Ratio for Entrances / Ratio for Exits

Year-to-Year Gross Flow for Food Stamps = [2.90% 1.21% 0.94% 94.95%]

Exit Rate for Food Stamps = 29.54% Standard Error = 1.23%

Entrance Rate for Food Stamps = 0.978% Standard Error = 0.064%

TABLE B

Ratio of Bias to Standard Error for Decreased Observed
Year-to-Year Transition Rates for Food Stamps

ERROR RATES	Assumed True Month-to-Month Gross Flows (Y_m): Intuition (Near Within) (1) — Entrances	Intuition (Near Within) (1) — Exits	Weighted Average (2) — Entrances	Weighted Average (2) — Exits	Upper Estimate (Near Between) (3) — Entrances	Upper Estimate (Near Between) (3) — Exits
Original (1)	7.64	7.67	5.16	5.27	3.27	3.26
Double False Negative (2)	7.50	8.23	4.95	5.82	3.08	3.85
Double False Positive (3)	7.59	6.05	5.17	3.70	3.28	1.66
Double All (4)	7.08	6.28	4.74	4.02	2.94	2.10
Double Both for Flow Types 2 & 3 (5)	7.23	6.98	4.83	4.70	3.00	2.79
One Third of False Negative (6)	8.12	7.66	5.54	5.18	3.54	3.04

Key

	Y_m	
ERROR RATE	Ratio for Entrances	Ratio for Exits

Year-to-Year Gross Flow for Food Stamps = [3.26% 0.85% 0.66% 95.23%]

Exit Rate for Food Stamps = 20.68% Standard Error = 0.98%

Entrance Rate for Food Stamps = 0.685% Standard Error = 0.046%

TABLE C

Ratio of Bias to Standard Error for Increased of Observed Year-to-Year Transition Rates for Food Stamps

ERROR RATES	Assumed True Month-to-Month Gross Flows (Y_m)					
	Intuition (Near Within) (1)		Weighted Average (2)		Upper Estimate (Near Between) (3)	
	Ratio for Entrances	Ratio for Exits	Ratio for Entrances	Ratio for Exits	Ratio for Entrances	Ratio for Exits
Original (1)	3.49	3.70	2.41	2.33	1.46	1.05
Double False Negative (2)	2.50	3.70	1.49	2.42	0.62	1.26
Double False Positive (3)	3.66	1.48	2.55	0.01	1.56	-1.39
Double All (4)	2.56	1.34	1.56	0.01	0.67	-1.24
Double Both for Flow Types 2 & 3 (5)	2.62	2.66	1.60	1.36	0.70	0.16
One Third of False Negative (6)	4.40	4.04	3.20	2.53	2.11	1.09

Key

	Y_m	
ERROR RATE	Ratio for Entrances	Ratio for Exits

Year-to-Year Gross Flow for Food Stamps = [2.53% 1.58% 1.22% 94.67%]

Exit Rate for Food Stamps = 38.40% Standard Error = 1.37%

Entrance Rate for Food Stamps = 1.272% Standard Error = 0.078%

Appendix A

In Appendix A, we provide more detailed explanations and results of our sensitivity analysis. For illustrative purposes we use Table A-11. This corresponds to row 1 - column 1 of Table A, which used the original error rates (Column B($C_1,\ldots,C_4$) and Column C($C_5,\ldots,C_8$)), our intuited Y_R (Column G), and the observed year-to-year gross flows (Column I). Column D is the conditional error rates ($C_9,\ldots,C_{12}$) when r=1. Column E is the within-wave observed month-to-month gross flows (Y_W).[9] As explained in Section V.A.2., the inverse of the matrix $\hat{M}_{r=1}$ defined by Columns B, C, and D applied to Y_W results in our intuited Y_R. Inserting the between-wave observed month-to-month gross flows (Y_B: Column F) into (3) determines r (Column K). Note, r is the measure of association between error rates from different reference periods. Using linear interpolation between $(C_5,\ldots,C_8)^T$ and $(1,0,0,1)^T$, which correspond to r=0 and r=1, respectively, determines $(C_9,\ldots,C_{12})^T$. Thus, $\hat{M}$ is defined (bottom of table). Applying $\hat{M}^{-1}$ to the observed year-to-year gross flows produces the "true" year-to-year gross flows (Column J). Note, applying $(I-\hat{M}^{-1})$ estimates the biases in the year-to-year gross flows directly (Column I-Column J). For our research, we analyzed the biases in the transition rates. Inputting the observed and "true" year-to-year gross flows into (4) and (5) estimates the absolute bias for the exit rate (6.31%) and entrance rate (0.311%), respectively (Column O). Dividing these by their respective "true" transition rate produces their relative bias (Column P). The standard errors are computed in the following manner:

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9 "Wave" is synonymous with reference period.

$$\text{Standard Error (SE)} = \sqrt{\frac{b}{y} P(1-P)},$$

where b = generalized variance parameter = 6766,

y = base population (8,000,000 for exits and 109,000,000 for entrances),

p = "true" transition rate.

The SE for the exit rate and the entrance rate are 1.23% and 0.064%, respectively (Column Q). The ratio of absolute bias to SE for exits (5.13) and entrances (4.85) are given in Column R.

Note, applying $\hat{M}^{-1}$ to Y_R (Column G) produces the projected between-wave month-to-month gross flows (Column H). We believe differences between this and the between-wave observed month-to-month gross flows (Column F) are caused by different between-wave to within-wave ratios for flow types 2 and 3.

Table A-11

A	B	C	D	E	F	G	H	I	J	K
Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.038923	0.036170	0.028965	0.030896	0.31925
YES-NO	0.0597	0.0034	0.0000	0.001287	0.005865	0.001374	0.004984	0.012141	0.009349	
NO-YES	0.0034	0.0597	0.0000	0.001645	0.004461	0.001756	0.005342	0.009381	0.006403	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.953504	0.949513	0.953351	

L	M	N	O	P	Q	R
Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	23.230%	6.306%	27.145%	1.228%	5.13
Entrances(n-y)	0.978%	0.667%	0.311%	46.638%	0.064%	4.85

$$M = \begin{matrix} 0.902086 & 0.003262 & 0.003262 & 0.001093 \\ 0.038214 & 0.937038 & 0.000138 & 0.002307 \\ 0.038214 & 0.000138 & 0.937038 & 0.002307 \\ 0.021486 & 0.059562 & 0.059562 & 0.994293 \end{matrix}$$

Table A-21

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.038923	0.033752	0.028965	0.033092	0.4825
YES-NO	0.1194	0.0034	0.0000	0.001287	0.005865	0.001374	0.004996	0.012141	0.009892	
NO-YES	0.0034	0.1194	0.0000	0.001645	0.004461	0.001756	0.005331	0.009381	0.006746	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.955922	0.949513	0.950270	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	23.013%	6.523%	28.343%	1.224%	5.33
Entrances(n-y)	0.978%	0.705%	0.273%	38.794%	0.066%	4.15

$$M = \begin{matrix} 0.826294 & 0.003190 & 0.003190 & 0.001650 \\ 0.054306 & 0.877410 & 0.000210 & 0.001750 \\ 0.054306 & 0.000210 & 0.877410 & 0.001750 \\ 0.065094 & 0.119190 & 0.119190 & 0.994850 \end{matrix}$$

Table A-31

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.038923	0.039432	0.028965	0.027414	0.57223
YES-NO	0.0597	0.0068	0.0000	0.001287	0.005865	0.001374	0.004985	0.012141	0.009336	
NO-YES	0.0068	0.0597	0.0000	0.001645	0.004461	0.001756	0.005342	0.009381	0.006380	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.957948	0.950242	0.949513	0.956870	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	25.405%	4.131%	16.259%	1.266%	3.26
Entrances(n-y)	0.978%	0.662%	0.316%	47.711%	0.064%	4.94

M =

0.916286	0.006626	0.006626	0.003911
0.024014	0.933674	0.000174	0.002889
0.024014	0.000174	0.933674	0.002889
0.035686	0.059526	0.059526	0.990311

Table A-41

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.038923	0.037015	0.028965	0.029287	0.64067
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.001374	0.004997	0.012141	0.009973	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.001756	0.005330	0.009381	0.006815	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.957948	0.952659	0.949513	0.953925	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	25.403%	4.133%	16.271%	1.266%	3.26
Entrances(n-y)	0.978%	0.709%	0.269%	37.925%	0.066%	4.07

M =

0.842819	0.006508	0.006508	0.004373
0.037781	0.874092	0.000292	0.002427
0.037781	0.000292	0.874092	0.002427
0.081619	0.119108	0.119108	0.990773

Table A-51

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.038923	0.036081	0.028965	0.030938	0.30132
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.001374	0.004997	0.012141	0.009915	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.001756	0.005330	0.009381	0.006756	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.953593	0.949513	0.952391	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	24.269%	5.267%	21.701%	1.247%	4.22
Entrances(n-y)	0.978%	0.704%	0.274%	38.890%	0.066%	4.16

M =	0.901079	0.006233	0.006233	0.001033
	0.039221	0.874367	0.000567	0.002367
	0.039221	0.000567	0.874367	0.002367
	0.020479	0.118833	0.118833	0.994233

Table A-61

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0199	0.0199	1.0000	0.039867	0.036444	0.038923	0.037781	0.028965	0.029723	0.03240
YES-NO	0.0199	0.0034	0.0000	0.001287	0.005865	0.001374	0.004977	0.012141	0.008883	
NO-YES	0.0034	0.0199	0.0000	0.001645	0.004461	0.001756	0.005350	0.009381	0.006057	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.951893	0.949513	0.955337	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	23.009%	6.526%	28.364%	1.224%	5.33
Entrances(n-y)	0.978%	0.630%	0.348%	55.281%	0.062%	5.59

M =	0.962398	0.003339	0.003339	0.000325
	0.017702	0.976761	0.000061	0.003075
	0.017702	0.000061	0.976761	0.003075
	0.002198	0.019839	0.013839	0.993525

Table A-12

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.039011	0.037025	0.028965	0.030115	0.46153
YES-NO	0.0597	0.0034	0.0000	0.001287	0.005865	0.002431	0.005202	0.012141	0.010130	
NO-YES	0.0034	0.0597	0.0000	0.001645	0.004461	0.002349	0.005125	0.009381	0.007184	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.952648	0.949513	0.952570	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	25.171%	4.365%	17.340%	1.262%	3.46
Entrances(n-y)	0.978%	0.749%	0.230%	30.692%	0.068%	3.38

M =	0.910076	0.003291	0.003291	0.001576
	0.030224	0.937009	0.000109	0.001824
	0.030224	0.000109	0.937009	0.001824
	0.029476	0.059591	0.059591	0.994776

Table A-22

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.039011	0.034554	0.028965	0.032296	0.58240
YES-NO	0.1194	0.0034	0.0000	0.001287	0.005865	0.002431	0.005199	0.012141	0.010689	
NO-YES	0.0034	0.1194	0.0000	0.001645	0.004461	0.002349	0.005127	0.009381	0.007543	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.955120	0.949513	0.949473	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	24.867%	4.669%	18.775%	1.257%	3.71
Entrances(n-y)	0.978%	0.788%	0.190%	24.130%	0.070%	2.73

M =	0.836692	0.003230	0.003230	0.001985
	0.043908	0.877370	0.000170	0.001415
	0.043908	0.000170	0.877370	0.001415
	0.075492	0.119230	0.119230	0.995185

Table A-32

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.039011	0.040285	0.028965	0.026634	0.66101
YES-NO	0.0597	0.0068	0.0000	0.001287	0.005865	0.002431	0.005202	0.012141	0.010116	
NO-YES	0.0068	0.0597	0.0000	0.001645	0.004461	0.002349	0.005125	0.009381	0.007159	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.956209	0.949389	0.949513	0.956091	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	27.525%	2.010%	7.304%	1.299%	1.55
Entrances(n-y)	0.978%	0.743%	0.235%	31.634%	0.068%	3.47

M =	0.921274	0.006662	0.006662	0.004511
	0.019029	0.933638	0.000138	0.002289
	0.019029	0.000138	0.933638	0.002289
	0.040671	0.059562	0.059562	0.990911

Table A-42

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.039011	0.037813	0.028965	0.028514	0.70892
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.002431	0.005199	0.012141	0.010746	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.002349	0.005127	0.009381	0.007588	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.956209	0.951861	0.949513	0.953152	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	27.372%	2.164%	7.906%	1.297%	1.67
Entrances(n-y)	0.978%	0.790%	0.189%	23.871%	0.070%	2.70

M =	0.849995	0.006564	0.006564	0.004834
	0.030605	0.874036	0.000236	0.001966
	0.030605	0.000236	0.874036	0.001966
	0.088795	0.119164	0.119164	0.991234

Table A-52

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.039011	0.036891	0.028965	0.030201	0.434'3
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.002431	0.005199	0.012141	0.010699	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.002349	0.005127	0.009381	0.007540	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.952783	0.949513	0.951560	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	26.159%	3.377%	12.910%	1.278%	2.64
Entrances(n-y)	0.978%	0.786%	0.192%	24.438%	0.070%	2.76

M =	0.908534	0.006341	0.006341	0.001483
	0.031766	0.874259	0.000459	0.001917
	0.031766	0.000459	0.874259	0.001917
	0.027934	0.118941	0.118941	0.994683

Table A-62

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0199	0.0199	1.0000	0.039867	0.036444	0.039011	0.038673	0.028965	0.028925	0.29299
YES-NO	0.0199	0.0034	0.0000	0.001287	0.005865	0.002431	0.005203	0.012141	0.009680	
NO-YES	0.0034	0.0199	0.0000	0.001645	0.004461	0.002349	0.005123	0.009381	0.006854	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.951000	0.949513	0.954540	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	25.074%	4.461%	17:793%	1.261%	3.54
Entrances(n-y)	0.978%	0.713%	0.265%	37.220%	0.066%	4.00

M =	0.966310	0.003352	0.003352	0.001004
	0.013790	0.976748	0.000048	0.002396
	0.013790	0.000048	0.976748	0.002396
	0.006110	0.019852	0.019852	0.994204

Table A-13

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.037954	0.036808	0.028965	0.029372	0.59941
YES-NO	0.0597	0.0034	0.0000	0.001287	0.005865	0.003488	0.005419	0.012141	0.010873	
NO-YES	0.0034	0.0597	0.0000	0.001645	0.004461	0.002942	0.004907	0.009381	0.007927	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.952866	0.949513	0.951827	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	27.017%	2.519%	9.324%	1.291%	1.95
Entrances(n-y)	0.978%	0.826%	0.152%	18.446%	0.071%	2.14

M =	0.917819	0.003319	0.003319	0.002043
	0.022487	0.936981	0.000081	0.001357
	0.022487	0.000081	0.936981	0.001357
	0.037213	0.059619	0.059619	0.995243

Table A-23

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.037954	0.034350	0.028965	0.031560	0.67598
YES-NO	0.1194	0.0034	0.0000	0.001287	0.005865	0.003488	0.005403	0.012141	0.011425	
NO-YES	0.0034	0.1194	0.0000	0.001645	0.004461	0.002942	0.004924	0.009381	0.008278	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.955323	0.949513	0.948737	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	26.578%	2.958%	11.128%	1.285%	2.30
Entrances(n-y)	0.978%	0.865%	0.113%	13.101%	0.073%	1.55

M =	0.846532	0.003268	0.003268	0.002302
	0.034068	0.877332	0.000132	0.001098
	0.034068	0.000132	0.877332	0.001098
	0.085332	0.119268	0.119268	0.995502

Table A-33

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	'True' Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.037954	0.040069	0.028965	0.025878	0.74822
YES-NO	0.0597	0.0068	0.0000	0.001287	0.005865	0.003488	0.005418	0.012141	0.010872	
NO-YES	0.0068	0.0597	0.0000	0.001645	0.004461	0.002942	0.004908	0.009381	0.007915	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.955616	0.949605	0.949513	0:955335	

Transition Group (Year-to year status)	Observed Transition Rate	'True' Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	29.583%	-0.047%	-0.160%	1.327%	-0.04
Entrances(n-y)	0.978%	0.822%	0.157%	19.057%	0.071%	2.20

M =	0.926166	0.006698	0.006698	0.005100
	0.014134	0.933602	0.000102	0.001700
	0.014134	0.000102	0.933602	0.001700
	0.045566	0.059598	0.059598	0.991500

Table A-43

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	'True' Year-to Year Gross Flows	
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.037954	0.037610	0.028965	0.027782	0.77474
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.003488	0.005402	0.012141	0.011479	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.002942	0.004925	0.009381	0.008320	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0,955616	0.952063	0.949513	0.952419	

Transition Group (Year-to year status)	Observed Transition Rate	'True' Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	29.238%	0.298%	1.019%	1.323%	0.23
Entrances(n-y)	0.978%	0.866%	0.112%	12.964%	0.073%	1.54

M =	0.856915	0.006617	0.006617	0.005279
	0.023685	0.873983	0.000183	0.001521
	0.023685	0.000183	0.873983	0.001521
	0.095715	0.119217	0.119217	0.991679

Table A-53

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.037954	0.036627	0.028965	0.029503	0.56196
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.003488	0.005402	0.012141	0.011441	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.002942	0.004925	0.009381	0.008283	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.953047	0.949513	0.950773	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	27.943%	1.593%	5.700%	1.305%	1.22
Entrances(n-y)	0.978%	0.864%	0.115%	13.281%	0.073%	1.57

M =	0.915710	0.006444	0.006444	0.001916
	0.024590	0.874156	0.000356	0.001484
	0.024590	0.000356	0.874156	0.001484
	0.035110	0.119044	0.119044	0.995116

Table A-63

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0199	0.0199	1.0000	0.039867	0.036444	0.037954	0.038447	0.028965	0.028144	0.49151
YES-NO	0.0199	0.0034	0.0000	0.001287	0.005865	0.003488	0.005430	0.012141	0.010462	
NO-YES	0.0034	0.0199	0.0000	0.001645	0.004461	0.002942	0.004897	0.009381	0.007636	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.951227	0.949513	0.953759	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	29.536%	27.099%	2.437%	8.993%	1.293%	1.89
Entrances(n-y)	0.978%	0.794%	0.184%	23.175%	0.070%	2.63

M =	0.970182	0.003366	0.003366	0.001677
	0.009918	0.976734	0.000034	0.001723
	0.009918	0.000034	0.976734	0.001723
	0.009982	0.019866	0.019866	0.994877

Appendix B

Table B-11

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.038923	0.036170	0.032607	0.034956	0.31925
YES-NO	0.0597	0.0034	0.0000	0.001287	0.005865	0.001374	0.004984	0.008499	0.005289	
NO-YES	0.0034	0.0597	0.0000	0.001645	0.004461	0.001756	0.005342	0.006567	0.003227	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.953504	0.952327	0.956528	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	13.142%	7.533%	57.321%	0.983%	7.67
Entrances(n-y)	0.685%	.0.336%	0.349%	103.679%	0.046%	7.64

M =	0.902086	0.003262	0.003262	0.001093
	0.038214	0.937038	0.000138	0.002307
	0.038214	0.000138	0.937038	0.002307
	0.021486	0.059562	0.059562	0.994293

Table B-21

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.038923	0.033752	0.032607	0.037524	0.4835'
YES-NO	0.1194	0.0034	0.0000	0.001287	0.005865	0.001374	0.004996	0.008499	0.005460	
NO-YES	0.0034	0.1194	0.0000	0.001645	0.004461	0.001756	0.005331	0.006567	0.003258	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.955922	0.952327	0.953757	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	12.703%	7.972%	62.753%	0.968%	8.23
Entrances(n-y)	0.685%	0.340%	0.344%	101.161%	0.046%	7.50

M =	0.826294	0.003190	0.003190	0.001650
	0.054306	0.877410	0.000210	0.001750
	0.054306	0.000210	0.877410	0.001750
	0.065094	0.119190	0.119190	0.994850

Table B-31

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.033867	0.036444	0.038923	0.039432	0.032507	0.031427	0.57223
YES-NO	0.0597	0.0068	0.0000	0.001287	0.005865	0.001374	0.004985	0.008499	0.005323	
NO-YES	0.0068	0.0597	0.0000	0.001645	0.004461	0.001756	0.005342	0.006567	0.003253	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.957948	0.950242	0.952327	0.959997	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	14.484%	6.191%	42.740%	1.024%	6.05
Entrances(n-y)	0.685%	0.338%	0.347%	102.760%	0.046%	7.59

M =	0.916286	0.006626	0.006626	0.003911
	0.024014	0.933674	0.000174	0.002889
	0.024014	0.000174	0.933674	0.002889
	0.035686	0.059526	0.059526	0.990311

Table B-41

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.038923	0.037015	0.032607	0.033651	0.64067
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.001374	0.004997	0.008499	0.005609	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.001756	0.005330	0.006567	0.003398	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.957948	0.952659	0.952327	0.357341	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	14.287%	6.388%	44.710%	1.018%	6.28
Entrances(n-y)	0.685%	0.354%	0.331%	93.609%	0.047%	7.08

M =	0.842819	0.006508	0.006508	0.004373
	0.037781	0.874092	0.000292	0.002427
	0.037781	0.000292	0.874092	0.002427
	0.081619	0.119108	0.119108	0.990773

Table B-51

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.038923	0.036081	0.032607	0.035030	0.30132
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.001374	0.004997	0.008499	0.005558	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.001756	0.005330	0.006567	0.003347	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.953593	0.952327	0.956066	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	13.693%	6.982%	50.988%	1.000%	6.98
Entrances(n-y)	0.685%	0.349%	0.336%	96.320%	0.046%	7.23

M =	0.901079	0.006233	0.006233	0.001033
	0.039221	0.874367	0.000567	0.002367
	0.039221	0.000567	0.874367	0.002367
	0.020479	0.118833	0.118833	0.994233

Table B-61

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0199	0.0199	1.0000	0.039867	0.036444	0.038923	0.037781	0.032607	0.033530	0.09240
YES-NO	0.0199	0.0034	0.0000	0.001287	0.005865	0.001374	0.004977	0.008499	0.005076	
NO-YES	0.0034	0.0199	0.0000	0.001645	0.004461	0.001756	0.005350	0.006567	0.003098	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.951893	0.952327	0.958297	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	13.148%	7.527%	57.249%	0.983%	7.66
Entrances(n-y)	0.685%	0.322%	0.363%	112.536%	0.045%	8.12

M =	0.962398	0.003339	0.003339	0.000325
	0.017702	0.976761	0.000061	0.003075
	0.017702	0.000061	0.976761	0.003075
	0.002198	0.019839	0.019839	0.993525

Table B-12

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	'True' Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.039011	0.037025	0.032607	0.034'38	0.46'59
YES-NO	0.0597	0.0034	0.0000	0.001287	0.005865	0.002431	0.005202	0.008499	0.006108	
NO-YES	0.0034	0.0597	0.0000	0.001645	0.004461	0.002349	0.005125	0.006567	0.004046	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.952648	0.952327	0.955709	

Transition Group (Year-to year status)	Observed Transition Rate	'True' Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	15.176%	5.499%	36.236%	1.043%	5.27
Entrances(n-y)	0.685%	0.422%	0.263%	62.466%	0.051%	5.16

M =	0.910076	0.003291	0.003291	0.001576
	0.030224	0.937009	0.000109	0.001824
	0.030224	0.000109	0.937009	0.001824
	0.029476	0.059591	0.059591	0.994776

Table B-22

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	'True' Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.039011	0.034554	0.032607	0.036671	0.58240
YES-NO	0.1194	0.0034	0.0000	0.001287	0.005865	0.002431	0.005199	0.008499	0.006314	
NO-YES	0.0034	0.1194	0.0000	0.001645	0.004461	0.002349	0.005127	0.006567	0.004111	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.955120	0.952327	0.952904	

Transition Group (Year-to year status)	Observed Transition Rate	'True' Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	14.688%	5.987%	40.757%	1.029%	5.82
Entrances(n-y)	0.685%	0.430%	0.255%	59.410%	0.052%	4.95

M =	0.836692	0.003230	0.003230	0.001985
	0.043908	0.877370	0.000170	0.001415
	0.043908	0.000170	0.877370	0.001415
	0.075492	0.119230	0.119230	0.995185

Table B-32

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.039011	0.040285	0.032607	0.030624	0.66101
YES-NO	0.0597	0.0068	0.0000	0.001287	0.005865	0.002431	0.005202	0.008499	0.006126	
NO-YES	0.0068	0.0597	0.0000	0.001645	0.004461	0.002349	0.005125	0.006567	0.004056	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.956209	0.949389	0.952327	0.959134	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	16.669%	4.006%	24.032%	1.084%	3.70
Entrances(n-y)	0.685%	0.421%	0.264%	62.625%	0.051%	5.17

$$M = \begin{matrix} 0.921274 & 0.006662 & 0.006662 & 0.004511 \\ 0.019029 & 0.933638 & 0.000138 & 0.002289 \\ 0.019029 & 0.000138 & 0.933638 & 0.002289 \\ 0.040671 & 0.059562 & 0.059562 & 0.990911 \end{matrix}$$

Table B-42

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.039011	0.037813	0.032607	0.032840	0.70892
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.002431	0.005199	0.008499	0.006421	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.002349	0.005127	0.006567	0.004210	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.956209	0.951861	0.952327	0.956529	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	16.355%	4.320%	26.416%	1.076%	4.02
Entrances(n-y)	0.685%	0.438%	0.247%	56.279%	0.052%	4.74

$$M = \begin{matrix} 0.849995 & 0.006564 & 0.006564 & 0.004834 \\ 0.030605 & 0.874036 & 0.000236 & 0.001966 \\ 0.030605 & 0.000236 & 0.874036 & 0.001966 \\ 0.088795 & 0.119164 & 0.119164 & 0.991234 \end{matrix}$$

Table B-52

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.039011	0.036891	0.032607	0.034258	0.43413
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.002431	0.005199	0.008499	0.006379	
NO-YES	0.0068	0,1194	0.0000	0.001645	0.004461	0.002349	0.005127	0.006567	0.004168	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.952783	0.952327	0.955195	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	15.698%	4.977%	31.705%	1.058%	4.70
Entrances(n-y)	0.685%	0.434%	0.250%	57.622%	0.052%	4.83

$$M = \begin{matrix} 0.908534 & 0.006341 & 0.006341 & 0.001483 \\ 0.031766 & 0.874259 & 0.000459 & 0.001917 \\ 0.031766 & 0.000459 & 0.874259 & 0.001917 \\ 0.027934 & 0.118941 & 0.118941 & 0.994683 \end{matrix}$$

Table B-62

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0199	0.0199	1.0000	0.039867	0.036444	0.039011	0.038673	0.032607	0.032715	0.29299
YES-NO	0.0199	0.0034	0.0000	0.001287	0.005865	0.002431	0.005203	0.008499	0.005891	
NO-YES	0.0034	0.0199	0.0000	0.001645	0.004461	0.002349	0.005123	0.006567	0.003912	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.951000	0.952327	0.957482	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	15.258%	5.417%	35.501%	1.046%	5.18
Entrances(n-y)	0.685%	0.407%	0.278%	68.279%	0.050%	5.54

$$M = \begin{matrix} 0.966310 & 0.003352 & 0.003352 & 0.001004 \\ 0.013790 & 0.976748 & 0.000048 & 0.002396 \\ 0.013790 & 0.000048 & 0.976748 & 0.002396 \\ 0.006110 & 0.019852 & 0.019852 & 0.994204 \end{matrix}$$

Table B-13

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.037954	0.036808	0.032607	0.033360	0.5994'
YES-NO	0.0597	0.0034	0.0000	0.001287	0.005865	0.003488	0.005419	0.008499	0.006886	
NO-YES	0.0034	0:0597	0.0000	0.001645	0.004461	0.002942	0.004907	0.006567	0.004824	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.952866	0.952327	0.954931	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	17.110%	3.565%	20.838%	1.095%	3.26
Entrances(n-y)	0.685%	0.503%	0.182%	36.254%	0.056%	3.27

M =	0.917813	0.003319	0.003319	0.002043
	0.022487	0.936981	0.000081	0.001357
	0.022487	0.000081	0.936981	0.001357
	0.037213	0.059619	0.059619	0.995243

Table B-23

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.037954	0.034350	0.032607	0.035883	0.67598
YES-NO	0.1194	0.0034	0.0000	0.001287	0.005865	0.003488	0.005403	0.008499	0.007101	
NO-YES	0.0034	0.1194	0.0000	0.001645	0.004461	0.002942	0.004924	0.006567	0.004899	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.955323	0.952327	0.952117	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	16.521%	4.154%	25.146%	1.080%	3.85
Entrances(n-y)	0.685%	0.512%	0.173%	33.782%	0.056%	3.08

M =	0.846532	0.003268	0.003268	0.002302
	0.034068	0.877332	0.000132	0.001098
	0.034068	0.000132	0.877332	0.001098
	0.085332	0.119268	0.119268	0.995502

Table B-33

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.037954	0.040068	0.032607	0.029845	0.74822
YES-NO	0.0597	0.0068	0.0000	0.001287	0.005865	0.003488	0.005418	0.008439	0.006905	
NO-YES	0.0068	0.0597	0.0000	0.001645	0.004461	0.002942	0.004908	0.006567	0.004836	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.955616	0.949605	0.952327	0.958415	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	18.790%	1.885%	10.035%	1.136%	1.66
Entrances(n-y)	0.685%	0.502%	0.183%	36.418%	0.056%	3.28

M =	0.926166	0.006698	0.006698	0.005100
	0.014134	0.933602	0.000102	0.001700
	0.014134	0.000102	0.933602	0.001700
	0.045566	0.059598	0.059598	0.991500

Table B-43

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.037954	0.037610	0.032607	0.032070	0.77474
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.003488	0.005402	0.008499	0.007190	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.002942	0.004925	0.006567	0.004979	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.955616	0.952063	0.952327	0.955760	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	18.314%	2.361%	12.892%	1.125%	2.10
Entrances(n-y)	0.685%	0.518%	0.167%	32.137%	0.057%	2.94

M =	0.856915	0.006617	0.006617	0.005279
	0.023685	0.873983	0.000183	0.001521
	0.023685	0.000183	0.873983	0.001521
	0.095715	0.119217	0.119217	0.991679

Table B-53

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	'True' Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.037954	0.036627	0.032607	0.033527	0.56196
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.003488	0.005402	0.008499	0.007157	
NO-YES	0.0068	0:1194	0.0000	0.001645	0.004461	0.002942	0.004925	0.006567	0.004946	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.953047	0.952327	0.954371	

Transition Group (Year-to year status)	Observed Transition Rate	'True' Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	17.591%	3.084%	17.533%	1.107%	2.79
Entrances(n-y)	0.685%	0.516%	0.169%	32.839%	0.056%	3.00

M =	0.915710	0.006444	0.006444	0.001916
	0.024590	0.874156	0.000356	0.001484
	0.024590	0.000356	0.874156	0.001484
	0.035110	0.119044	0.119044	0.995116

Table B-63

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	'True' Year-to Year Gross Flows	r
YES-YES	0.0199	0.0199	1.0000	0.039867	0.036444	0.037954	0.038447	0.032607	0.031916	0.49151
YES-NO	0.0199	0.0034	0.0000	0.001287	0.005865	0.003488	0.005430	0.008499	0.006689	
NO-YES	0.0034	0.0199	0.0000	0.001645	0.004461	0.002942	0.004897	0.006567	0.004711	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.951227	0.952327	0.956683	

Transition Group (Year-to year status)	Observed Transition Rate	'True' Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	20.675%	17.327%	3.348%	19.321%	1.101%	3.04
Entrances(n-y)	0.685%	0.490%	0.195%	39.749%	0.055%	3.54

M =	0.970182	0.003366	0.003366	0.001677
	0.009918	0.976734	0.000034	0.001723
	0.009918	0.000034	0.976734	0.001723
	0.009982	0.019866	0.019866	0.994877

Appendix C

Table C-11

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.038923	0.036170	0.025323	0.026837	0.31926
YES-NO	0.0597	0.0034	0.0000	0.001287	0.005865	0.001374	0.004984	0.015783	0.013409	
NO-YES	0.0034	0.0597	0.0000	0.001645	0.004461	0.001756	0.005342	0.012195	0.009579	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.953504	0.946699	0.950175	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	33.318%	5.079%	15.243%	1.371%	3.70
Entrances(n-y)	1.272%	0.998%	0.274%	27.423%	0.078%	3.49

$$M = \begin{matrix} 0.902086 & 0.003262 & 0.003262 & 0.001093 \\ 0.038214 & 0.937038 & 0.000138 & 0.002307 \\ 0.038214 & 0.000138 & 0.937038 & 0.002307 \\ 0.021486 & 0.059562 & 0.059562 & 0.994293 \end{matrix}$$

Table C-21

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.038923	0.033752	0.025323	0.028661	0.48351
YES-NO	0.1194	0.0034	0.0000	0.001287	0.005865	0.001374	0.004996	0.015783	0.014324	
NO-YES	0.0034	0.1194	0.0000	0.001645	0.004461	0.001756	0.005331	0.012195	0.010233	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.955922	0.946699	0.946782	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	33.323%	5.074%	15.226%	1.371%	3.70
Entrances(n-y)	1.272%	1.069%	0.203%	18.938%	0.081%	2.50

$$M = \begin{matrix} 0.826294 & 0.003190 & 0.003190 & 0.001650 \\ 0.054306 & 0.877410 & 0.000210 & 0.001750 \\ 0.054306 & 0.000210 & 0.877410 & 0.001750 \\ 0.065094 & 0.119190 & 0.119190 & 0.994850 \end{matrix}$$

Table C-31

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.038923	0.039432	0.025323	0.023400	0.57223
YES-NO	0.0597	0.0068	0.0000	0.001287	0.005865	0.001374	0.004985	0.015783	0.013350	
NO-YES	0.0068	0.0597	0.0000	0.001645	0.004461	0.001756	0.005342	0.012195	0.009506	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.957948	0.950242	0.946699	0.953744	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	36.326%	2.071%	5.700%	1.399%	1.48
Entrances(n-y)	1.272%	0.987%	0.285%	28.872%	0.078%	3.66

$$M = \begin{array}{cccc} 0.916286 & 0.006626 & 0.006626 & 0.003911 \\ 0.024014 & 0.933674 & 0.000174 & 0.002889 \\ 0.024014 & 0.000174 & 0.933674 & 0.002889 \\ 0.035686 & 0.059526 & 0.059526 & 0.990311 \end{array}$$

Table C-41

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.038923	0.037015	0.025323	0.024924	0.64067
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.001374	0.004997	0.015783	0.014337	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.001756	0.005330	0.012195	0.010231	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.957948	0.952659	0.946699	0.950508	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	36.518%	1.879%	5.145%	1.400%	1.34
Entrances(n-y)	1.272%	1.065%	0.207%	19.430%	0.081%	2.56

$$M = \begin{array}{cccc} 0.842819 & 0.006508 & 0.006508 & 0.004373 \\ 0.037781 & 0.874092 & 0.000292 & 0.002427 \\ 0.037781 & 0.000292 & 0.874092 & 0.002427 \\ 0.081619 & 0.119108 & 0.119108 & 0.990773 \end{array}$$

Table C-51

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.038923	0.036081	0.025323	0.026846	0.30[illegible]
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.001374	0.004997	0.015783	0.014272	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.001756	0.005330	0.012195	0.010165	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.953593	0.946699	0.948717	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	34.709%	3.688%	10.625%	1.384%	2.66
Entrances(n-y)	1.272%	1.060%	0.212%	19.968%	0.081%	2.62

$$M = \begin{matrix} 0.901079 & 0.006233 & 0.006233 & 0.001033 \\ 0.039221 & 0.874367 & 0.000567 & 0.002367 \\ 0.039221 & 0.000567 & 0.874367 & 0.002367 \\ 0.020479 & 0.118833 & 0.118833 & 0.994233 \end{matrix}$$

Table C-61

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0199	0.0199	1.0000	0.039867	0.036444	0.038923	0.037781	0.025323	0.025916	0.0324C
YES-NO	0.0199	0.0034	0.0000	0.001287	0.005865	0.001374	0.004977	0.015783	0.012690	
NO-YES	0.0034	0.0199	0.0000	0.001645	0.004461	0.001756	0.005350	0.012195	0.009016	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.957948	0.951893	0.946699	0.952378	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	32.871%	5.526%	16.810%	1.366%.	4.04
Entrances(n-y)	1.272%	0.938%	0.334%	35.609%	0.076%	4.40

$$M = \begin{matrix} 0.962398 & 0.003339 & 0.003339 & 0.000325 \\ 0.017702 & 0.976761 & 0.000061 & 0.003075 \\ 0.017702 & 0.000061 & 0.976761 & 0.003075 \\ 0.002198 & 0.019839 & 0.019839 & 0.993525 \end{matrix}$$

Table C-12

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.039011	0.037025	0.025323	0.026093	0.46159
YES-NO	0.0597	0.0034	0.0000	0.001287	0.005865	0.002431	0.005202	0.015783	0.014153	
NO-YES	0.0034	0.0597	0.0000	0.001645	0.004461	0.002349	0.005125	0.012195	0.010323	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.952648	0.946699	0.949431	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	35.167%	3.230%	9.185%	1.389%	2.33
Entrances(n-y)	1.272%	1.076%	0.196%	18.240%	0.081%	2.41

M =	0.910076	0.003291	0.003291	0.001576
	0.030224	0.937009	0.000109	0.001824
	0.030224	0.000109	0.937009	0.001824
	0.029476	0.059591	0.059591	0.994776

Table C-22

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.039011	0.034554	0.025323	0.027920	0.58240
YES-NO	0.1194	0.0034	0.0000	0.001287	0.005865	0.002431	0.005199	0.015783	0.015064	
NO-YES	0.0034	0.1194	0.0000	0.001645	0.004461	0.002349	0.005127	0.012195	0.010974	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.955120	0.946699	0.946042	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	35.046%	3.351%	9.562%	1.388%	2.42
Entrances(n-y)	1.272%	1.147%	0.125%	10.912%	0.084%	1.49

M =	0.836692	0.003230	0.003230	0.001985
	0.043908	0.877370	0.000170	0.001415
	0.043908	0.000170	0.877370	0.001415
	0.075492	0.119230	0.119230	0.995185

Table C-32

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.039011	0.040285	0.025323	0.022645	0.66101
YES-NO	0.0597	0.0068	0.0000	0.001287	0.005865	0.002431	0.005202	0.015783	0.014105	
NO-YES	0.0068	0.0597	0.0000	0.001645	0.004461	0.002349	0.005125	0.012195	0.010262	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.956209	0.949389	0.946699	0.952989	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	38.382%	0.015%	0.039%	1.414%	0.01
Entrances(n-y)	1.272%	1.065%	0.206%	19.384%	0.081%	2.55

$$M = \begin{matrix} 0.921274 & 0.006662 & 0.006662 & 0.004511 \\ 0.019029 & 0.933638 & 0.000138 & 0.002289 \\ 0.019029 & 0.000138 & 0.933638 & 0.002289 \\ 0.040671 & 0.059562 & 0.059562 & 0.990911 \end{matrix}$$

Table C-42

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.039011	0.037813	0.025323	0.024189	0.70892
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.002431	0.005199	0.015783	0.015072	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.002349	0.005127	0.012195	0.010966	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.956209	0.951861	0.946699	0.949774	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	38.389%	0.008%	0.020%	1.414%	0.01
Entrances(n-y)	1.272%	1.141%	0.130%	11.429%	0.084%	1.56

$$M = \begin{matrix} 0.849995 & 0.006564 & 0.006564 & 0.004834 \\ 0.030605 & 0.874036 & 0.000236 & 0.001966 \\ 0.030605 & 0.000236 & 0.874036 & 0.001966 \\ 0.088795 & 0.119164 & 0.119164 & 0.991234 \end{matrix}$$

Table C-52

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.039011	0.036891	0.025323	0.026144	0.43413
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.002431	0.005199	0.015783	0.015019	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.002349	0.005127	0.012195	0.010912	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.952783	0.946699	0.947925	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	36.486%	1.911%	5.237%	1.400%	1.36
Entrances(n-y)	1.272%	1.138%	0.134%	11.749%	0.084%	1.60

M =	0.908534	0.006341	0.006341	0.001483
	0.031766	0.874259	0.000459	0.001917
	0.031766	0.000459	0.874259	0.001917
	0.027934	0.118941	0.118941	0.994683

Table C-62

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0199	0.0199	1.0000	0.039867	0.036444	0.039011	0.038673	0.025323	0.025136	0.29299
YES-NO	0.0199	0.0034	0.0000	0.001287	0.005865	0.002431	0.005203	0.015783	0.013470	
NO-YES	0.0034	0.0199	0.0000	0.001645	0.004461	0.002349	0.005123	0.012195	0.009796	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.956209	0.951000	0.946699	0.951598	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	34.891%	3.506%	10.048%	1.386%	2.53
Entrances(n-y)	1.272%	1.019%	0.253%	24.816%	0.079%	3.20

M =	0.966310	0.003352	0.003352	0.001004
	0.013790	0.976748	0.000048	0.002396
	0.013790	0.000048	0.976748	0.002396
	0.006110	0.019852	0.019852	0.994204

Table C-13

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.037954	0.036808	0.025323	0.025385	0.5934'
YES-NO	0.0597	0.0034	0.0000	0.001287	0.005865	0.003488	0.005419	0.015783	0.014860	
NO-YES	0.0034	0.0597	0.0000	0.001645	0.004461	0.002942	0.004907	0.012195	0.011031	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.952866	0.946699	0.948724	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	36.924%	1.473%	3.988%	1.403%	1.05
Entrances(n-y)	1.272%	4.149%	0.122%	10.658%	0.084%	1.46

$$M = \begin{matrix} 0.917819 & 0.003319 & 0.003319 & 0.002043 \\ 0.022487 & 0.936981 & 0.000081 & 0.001357 \\ 0.022487 & 0.000081 & 0.936981 & 0.001357 \\ 0.037213 & 0.059619 & 0.059619 & 0.995243 \end{matrix}$$

Table C-23

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.037954	0.034350	0.025323	0.027237	0.67598
YES-NO	0.1194	0.0034	0.0000	0.001287	0.005865	0.003488	0.005403	0.015783	0.015748	
NO-YES	0.0034	0.1194	0.0000	0.001645	0.004461	0.002942	0.004924	0.012195	0.011657	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.955323	0.946699	0.945358	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	36.636%	1.761%	4.806%	1.401%	1.26
Entrances(n-y)	1.272%	1.218%	0.054%	4.409%	0.086%	0.62

$$M = \begin{matrix} 0.846532 & 0.003268 & 0.003268 & 0.002302 \\ 0.034068 & 0.877332 & 0.000132 & 0.001098 \\ 0.034068 & 0.000132 & 0.877332 & 0.001098 \\ 0.085332 & 0.119268 & 0.119268 & 0.995502 \end{matrix}$$

Table C-33

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.037954	0.040068	0.025323	0.021911	0.74822
YES-NO	0.0597	0.0068	0.0000	0.001287	0.005865	0.003488	0.005418	0.015783	0.014838	
NO-YES	0.0068	0:0597	0.0000	0.001645	0.004461	0.002942	0.004908	0.012195	0.010995	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.955616	0.949605	0.946699	0.952255	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	40.377%	-1.980%	-4.905%	1.427%	-1.39
Entrances(n-y)	1.272%	1.141%	0.130%	11.422%	0.084%	1.56

M =	0.926166	0.006698	0.006698	0.005100
	0.014134	0.933602	0.000102	0.001700
	0.014134	0.000102	0.933602	0.001700
	0.045566	0.059598	0.059598	0.991500

Table C-43

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.1194	0.1194	1.0000	0.039867	0.036444	0.037954	0.037610	0.025323	0.023493	0.77474
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.003488	0.005402	0.015783	0.015768	
NO-YES	0.0068	0.1194	0.0000	0.001645	0.004461	0.002942	0.004925	0.012195	0.011662	
NO-NO	0.0068	0.0068	1.0000	0.957202	0.953229	0.955616	0.952063	0.946699	0.949078	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	40.162%	-1.765%	-4.395%	1.426%	-1.24
Entrances(n-y)	1.272%	1.214%	0.058%	4.777%	0.086%	0.67

M =	0.856915	0.006617	0.006617	0.005279
	0.023685	0.873983	0.000183	0.001521
	0.023685	0.000183	0.873983	0.001521
	0.095715	0.119217	0.119217	0.991679

Table C-53

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0597	0.0597	1.0000	0.039867	0.036444	0.037954	0.036627	0.025323	0.025480	0.56196
YES-NO	0.1194	0.0068	0.0000	0.001287	0.005865	0.003488	0.005402	0.015783	0.015726	
NO-YES	0.0068	0:1194	0.0000	0.001645	0.004461	0.002942	0.004925	0.012195	0.011620	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.953047	0.946699	0.947175	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	38.164%	0.232%	0.609%	1.413%	0.16
Entrances(n-y)	1.272%	1.212%	0.060%	4.944%	0.086%	0.70

M =	0.915710	0.006444	0.006444	0.001916
	0.024590	0.874156	0.000356	0.001484
	0.024590	0.000356	0.874156	0.001484
	0.035110	0.119044	0.119044	0.995116

Table C-63

Group (True month-to month status)	Marginal Error Rate (Marginal probability of an error) Time 1	Time 2	Conditional Error Rate (Time 2 error given Time 1 error)	Within-Wave Observed Month-to Month Gross Flows	Between-Wave Observed Month-to Month Gross Flows	Assumed True Month-to Month Gross Flows	Projected Between-Wave Month-to Month Gross Flows	Observed Year-to Year Gross Flows	"True" Year-to Year Gross Flows	r
YES-YES	0.0199	0.0199	1.0000	0.039867	0.036444	0.037954	0.038447	0.025323	0.024371	0.49151
YES-NO	0.0199	0.0034	0.0000	0.001287	0.005865	0.003488	0.005430	0.015783	0.014234	
NO-YES	0.0034	0.0199	0.0000	0.001645	0.004461	0.002942	0.004897	0.012195	0.010561	
NO-NO	0.0034	0.0034	1.0000	0.957202	0.953229	0.955616	0.951227	0.946699	0.950834	

Transition Group (Year-to year status)	Observed Transition Rate	"True" Transition Rate	Absolute Bias	Relative Bias	Standard Error (SE)	Ratio Bias to SE
Exits(yes-no)	38.397%	36.871%	1.526%	4.139%	1.403%	1.09
Entrances(n-y)	1.272%	1.098%	0.173%	15.781%	0.082%	2.11

M =	0.970182	0.003366	0.003366	0.001677
	0.009918	0.976734	0.000034	0.001723
	0.009918	0.000034	0.976734	0.001723
	0.009982	0.019866	0.019866	0.994877