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A Short Note on RAS Method

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Abstract

For many researchers around the world, the applications of the RAS method can say in both easy way and difficult way. In our study, we would like to bring to readers the RAS method, and in the best way to understand in balancing the Supply-Use tables or Input-Output tables in the usual procedure. This work becomes easier if there is an effective software to do it automatically for all the balancing necessary steps in the usual way.

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Keywords: RAS method, Supply-Use tables, Input-Output tables, correct row total, correct column total.

1 Introduction

Almost countries compile input-output table or supply and use tables. However, this is not the case as many of the entries are only estimated, and need to be balanced either manually or by an automatic procedure. Addition, they also want to update supply and use tables and input-output table, so The RAS method is the most widely known and commonly used automatic procedure. This appendix shows a worked example on how the RAS method is used for balancing an S.U.T or I.O.T. Some experts believe that the RAS method is named after the economist Richard Stone (1919–1991), who, among his other achievements, co-authored the 1968 SNA together with Abraham Aidenof. His full name was John Richard Nicholas Stone. He did not have "A" as his middle initial so there must be another explanation for RAS. This paper is tried in order to explain clearly this approach and be easy for practically it.

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2 Preliminary Notes

The main target of RAS method is for balancing the columns and rows of input – output or supply and use tables when updating or revising these tables. The basic equations are cycle sometimes depend to the gap level. These equations were described as follow:

$$X_C^{new}(t_n).\ X_C^{new}(t_{n-1})..X_C^{new}(t_1).\mathbf{A}.X_R^{new}(t_1)\ldots\ X_R^{new}(t_{n-1}).\ X_R^{new}(t_n) = \mathbf{A}^{new} \quad (1)$$

Where:
$X_C^{new}(t_i)$ is new vector of gross output follow column of round t_i time
A is coefficient matrix of direct input
$X_R^{new}(t_i)$ is new vector of gross output follow row of round t_i time

These equations can do interaction easy by software or do directly by excel very quickly and easily.

3 Case Study

The basic data in Appendix Table 1 is a simple matrix of domestic production showing three commodities and three kinds of industries. The margin totals are assumed to be known accurately while the internal entries have been estimated from various less reliable sources. The task is to revise the less reliable internal entries so that they agree with the correct margin totals. The RAS adjustment can be seen as an iterative process in which columns and rows (or rows and columns) are successively forced to add up to the correct margin totals and the Balancing value of rows and columns become zero (0).

Table 1: Matrix of Domestic Production

Sectors	**Sector 1**	**Sector 2**	**Sector 3**	**Row Totals**	**Correct Row Totals**	**Balancing**
Sector 1	21.2	29.0	19.9	70.1	75.0	4.9
Sector 2	9.0	48.8	22.4	80.1	82.0	1.9
Sector 3	49.8	62.2	7.8	119.8	125.0	5.2
Column Totals	80.0	140.0	50.0			
Correct Column Totals	85.0	150.0	45.0			
Balancing	5.0	10.0	-5.0			

Table 2 presents the matrix A to be reallocated by Correct Row Totals first time with formula as yield: $A_R^{new}(t_1) = X_C^{new}(t_1).\mathbf{A}$
In this case, for the example with the first row and the first column (The old value is 21.2) The new value would be 22.7 after reallocation, and

22.7 = 21.2 / 70.1 * 75

This procedure is used for other value of rows until the balancing Rows become 0.

Table 2: First Iteration: Recalculating the Column Totals ($X_C^{new}(t_1).A$ - First Round)

Sectors	**Sector 1**	**Sector 2**	**Sector 3**	**Row Totals**	**Correct Row Totals**	**Balancing**
Sector 1	22.7	31.0	21.3	75.0	75.0	**0.0**
Sector 2	9.2	50.0	22.9	82.0	82.0	**0.0**
Sector 3	52.0	64.9	8.1	125.0	125.0	**0.0**
Column Totals	83.9	145.9	52.3			
Correct Column Totals	85.0	150.0	45.0			
Balancing	**1.1**	**4.1**	**-7.3**			

Table 3 shows the matrix A recalculated the column totals:

$X_C^{new}(t_1).\mathbf{A}.X_R^{new}(t_1)$

For the example of the first column with the balancing column value is 1.1
The old value of the first row and first column is 22.7
The new value of the first row and first column would be 23.0 after reallocation, and

23.0 = 22.7 / 83.9 * 85

Table 3: Second Iteration: Recalculating the Column Totals (second Round)

Sectors	**Sector 1**	**Sector 2**	**Sector 3**	**Row Totals**	**Correct Row Totals**	**Balancing**
Sector 1	23.0	31.9	18.3	73.2	75.0	**1.8**
Sector 2	9.3	51.4	19.7	80.4	82.0	**1.6**
Sector 3	52.7	66.8	7.0	126.4	125.0	**-1.4**
Column Totals	85.0	150.0	45.0			
Correct Column Totals	85.0	150.0	45.0			
Balancing	**0.0**	**0.0**	**0.0**			

After that, we copy value from table 3 (from sector 1 to sector 3) and paste special again into table 1. In this case we have to put about 7 times for balancing with correct column vectors and correct row vectors become 0. This result is showed in table 4.

Table 4: The result after practice RAS method

	Agriculture	Industry	Services	Row Totals	Correct Row Totals	Balancing
Crops	23.6	32.4	18.5	74.5	75.0	**0**
Manufactures	9.5	52.2	19.8	81.4	82.0	**0**
Services	51.9	65.4	6.8	124.1	125.0	**0**
Column Totals	85.0	150.0	45.0			
Correct Column Totals	85.0	150.0	45.0			
Balancing	**0.0**	**0.0**	**0.0**			

With the big difference between the total value (Row Totals and Column Totals) and the adjustment value (Correct Row Totals and Correct Column Totals), the manual methods "COPY and PASTE" value the iteration may make mistakes, and may take for sometimes. A software can be easily wrote based on equation (1). With the help of the software, this procedure becomes very easily and quickly, even this iteration is 7 times or 7 million times.

If this software can be designed based on Excel, the maximum rows number is more than 1 million rows and the maximum columns number is more than 16 thousand columns and absolutely appropriate for balancing and updating Supply-Use tables or Output-Output tables.

The users just define and input the data for:

- The number of rows and columns;
- The Correct Row Totals value and the Correct Column Total value;

Then, the software would do the balancing procedure automatically.

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Appendix

The flowchart describes how the software processes all steps in balancing the Supply-Use table or Input-Output table: