14

INPUT-OUTPUT ANALYSIS

CONTENTS

Input-output analysis is a macroeconomic analysis based on the interdependencies between economic sectors or industries. It was developed by Wassily Leontief, who won the Nobel Prize in Economics for his work in this area. It is used in economic projections of demand, employment, investment and output for the individual sectors of the economy; study of technological change and its effects; analysis of the effects of changes in wage, profit, and tax on prices; and study of economic relationships, use of natural resources, and development planning.

INPUT-OUTPUT TABLE

An **input-output table** describes the flow of goods and services between the sectors of an economy over a period of time. Table 14.1 shows an input-output table describing an economy. Sectoral inputs are recorded column-wise and outputs, row-wise. The nine entries (A_{ij}) in the main body of the table are the intersectoral flows. Of the total output of sector 1, A_{11} is used up in the sector 1 itself, A_{12} is absorbed, as one of its inputs, by sector 2, A_{13} is taken by sector 3 and F_1 is absorbed by final consumers (households). The second and the third rows similarly describe the allocation of the outputs of the two other sectors. Primary inputs comprise capital and labour.

BASIC DERIVATION

Table 14.1 depicts inter-industry relationships within the economy, showing how output from one sector may become an input to another sector. In the inter-sectoral matrix, each sector uses a particular proportion of output to meet its input needs as also those of other sectors. It uses the rest to satisfy the final demand. The input coefficient of sector *i* into sector *j* is the quantity of the output of sector *i* absorbed by sector *j* per unit of *j*'s total output. The input coefficient may be expressed as

$$\boldsymbol{a_{ij} = \frac{A_{ij}}{X_j}}$$

Where, a_{ij} is the input coefficient, A_{ij} refers to the inputs of the jth sector from the ith sector and, X_j, the total output of the jth sector.

Table 14.1 Input-Output Table

	1	2	3	Final Demand	Total Output
1	A_{11}	A_{12}	A_{13}	F_1	X_1
2	A_{21}	A_{22}	A_{23}	F_2	X_2
3	A_{31}	A_{32}	A_{33}	F_3	X_3
Primary Inputs	x_1	x_2	x_3		
Total Inputs	X_1	X_2	X_3		

We can have a matrix of coefficients (or technology matrix or input-output matrix),

$$A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

Generally, in any economy, the output of the sectors is given by

$$\boldsymbol{X = (I - A)^{-1} F}$$

Where the outputs, $X = \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix}$;

The Leontief matrix is

$$(I - A) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$$

The final demand, $F = \begin{bmatrix} F_1 \\ F_2 \\ F_3 \end{bmatrix}$.

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