**SOLUTIONS – MODULE 1**

**Question 1:** Name the most important parts of an input-output table, including the variable that is given to them in the common IO nomenclature. Please also explain the data they contain in the context of the IO structure.

**Answer:**

The Intermediate Consumption Matrix (Z): This matrix measures the interindustrial exchange of products flowing from producing sectors i (rows) to purchasing sectors j (columns).

The Imported Intermediate Consumption Matrix (Zm): Each cell in this matrix represents the imported inputs of domestic industry 𝑗d(columns)

The Value-Added Matrix (VA): The Value-added Matrix displays information on the compensation of factors of production (e.g. wages and profits) and other additional information affecting prices such as taxes, subsidies, transport margins, etc.

The Final Demand Matrix (FD/y): The Final Demand Matrix displays information on the components of demand, such as households' consumption, government consumption, investment, exports, and others. It follows the standard textbook GDP formula, only without the negative component of imports: Y = C+I+G+X. Sometimes exports are presented as “net exports” with imports already subtracted, matching GDP calculation.

The output vector (x): The Total Output vector depicts the total production of each sector in the economy that was needed to satisfy final demand given the current state of interindustry relations.

**Question 2:** Explain why the IO tables provide two different output vector and briefly explain their difference?

**Answer:** Total output can be calculated both from input (x = Z + v) and output (x = Z + y) perspectives. For a domestic economy, the vectors should be exactly the same when calculated from the different perspectives. Their equality represents the closed nature of IO Tables: all the value added to production has to be transformed in final demand.

**Question 3:** Referring to the Brazilian IO Table from 2010 from the WIOD Database, please retrieve the following data. Please give your answers in $.

3.1 What is the sectoral demand of *Machinery, nec* for *Basic Metals and Fabricated Metals?*

**Answer:** US$13,809 million.

3.2 What is the intra-industrial trade of the *Chemicals and Chemical products* sector?

**Answer:** US$18,727 million.

3.3 Name the sector with the highest total intermediate demand.

**Answer:** The sector is Food, Beverages and Tobacco, with a value of US$ 180,457 million of intermediate demand (total intermediate consumption).

3.4 Which three sectors account for the largest share of government consumption expenditure?

**Answer:** Public Admin and Defence, Compulsory Social Security; Education; Health and Social Work.

3.5 What are the largest capital investing sectors?

**Answer:** Construction; Machinery, Nec; Electrical and Optical Equipment.

3.6 Name the five most important exporting sectors in Brazil in 2010.

**Answer:** Food, Beverages and Tobacco; Mining and Quarrying; Agriculture, Hunting, Forestry and Fishing.

3.7 What is Brazilian’s total final demand? Please also add the differentiation between the domestic and the foreign part of final demand.

**Answer:** Domestic Final Demand: US$2,124,123million, Foreign Final Demand: US$79,636million.

3.8 Name the three most important sectors in terms of output both from a demand and from a supply perspective.

**Answer:** Food, Beverages and Tobacco; Construction; Financial Intermediation.

3.9 Name the top 3 sectors with highest value added at basic prices.

**Answer:** Public Admin and Defence, Compulsory Social Security; Real Estate Activities; Financial Intermediation.

**Question 4:** Using the following fictional Input Output Table, please answer the questions below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Industry A** | **Industry B** | **Final Demand** | **Total Output** |
| **Industry A** | 300 | 150 | 200 | 650 |
| **Industry B** | 250 | 200 | 10 | 460 |
| **Value Added** | 100 | 110 |  |  |

4.1 Compute the technical coefficient matrix and explain the meaning of the cell highlighted below.

|  |  |  |
| --- | --- | --- |
|  | **Industry A** | **Industry B** |
| **Industry A** | 0.4615 | 0.3261 |
| **Industry B** | 0.3846 | 0.4348 |

**Answer:** This is the A Matrix. Industry B needs 0,3261 monetary units of direct inputs from Industry A in order to produce 1 unit of its output.

4.2 Compute the output coefficient matrix and explain the meaning of the cell highlighted below.

|  |  |  |
| --- | --- | --- |
|  | **Industry A** | **Industry B** |
| **Industry A** | 0.4615 | 0.2308 |
| **Industry B** | 0.5435 | 0.4348 |

**Answer:** This is the B Matrix. Given 1 unit of output by Industry B, it directly supplies 0.5435 of it to Industry A.

4.3 Compute the Leontief matrix and explain the meaning of the cells highlighted below. Use R, excel or other tools to help with the calculations.

|  |  |  |
| --- | --- | --- |
|  | **Industry A** | **Industry B** |
| **Industry A** | 3.1589 | 1.8224 |
| **Industry B** | 2.1495 | 3.0093 |

**Answer:** This is the L Matrix. Industry B needs 3.0093 units of intra-industry direct and indirect inputs in order to produce 1 unit of output.

4.4 Compute the Ghosh matrix and explain the meaning of the cell highlighted below. Use R, excel or other tools to help with the calculations.

|  |  |  |
| --- | --- | --- |
|  | **Industry A** | **Industry B** |
| **Industry A** | 3.1589 | 1.2897 |
| **Industry B** | 3.0374 | 3.0093 |

**Answer:** This is the G Matrix. Given 1 unit of production of Industry A, 3.1589 units are directly and indirectly allocated intra-industry.

4.5 Provide a table with the A, B, L, and G Multipliers and explain the meaning of the cells highlighted below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **A** | **L** | **B** | **G** |
| **Industry A** | 0.8462 | 5.3084 | 0.6923 | 4.4486 |
| **Industry B** | 0.7609 | 4.8317 | 0.9783 | 6.0467 |

**Answer:** The production of 1 unit of output by Industry A generates 5.3084 of total demand of value in the whole economy. The production of 1 unit of output by Industry B allocates 6.0467 of total supply value in the whole economy.

**Question 5:** Following the approach presented in the videos, please compute the technical coefficient matrix, the output coefficient matrix, the Leontief inverse, the Ghosh matrix, and the respective Multipliers for Brazil in 2011. Using either R or excel, please answer the following questions:

5.1 What are the direct input requirements of sector *Food, Beverages and Tobacco* from the sector *Agriculture, Hunting, Forestry and Fishing* per unit of total output of *Food, Beverages and Tobacco?*

**Answer:** This is found in the A Matrix. US$0.315.

5.2 Considering the distribution of the output of sector i across sectors j that purchase interindustry inputs from sector i, if we assume that sector i = *Water Transport*, what are the top 3 sectors *j* with the largest share?

**Answer:** This is found in the B Matrix. Public Admin and Defence, Compulsory Social Security; Renting of M&Eq and Otther Business Activities; Financial Intermediation.

5.3 Assuming i = *Chemicals and Chemical Products* and *j = Rubber and Plastics,* please indicate the share of sector *i*’s output that is directly purchased by *j*. Please also indicate relative to which sectors output (i or j) the value is measured.

**Answer:** This is found in the A Matrix. Rubber and Plastics demands US$0.150 of direct inputs from Chemicals and Chemical Products. From sector i’s perspective, Chemicals and Chemical Products are required to directly supply US$0.150 of inputs so that the industry of Rubber and Plastics can produce 1 unit of output.

5.4 In order to produce one unit of *Construction,* what are the total direct and indirect requirements of the *Other non-metallic mineral* sector?

**Answer:** This is found in the L Matrix. In order to produce 1 unit of output, Construction demands US$0.110 of total direct and indirect products from the Other non-metallic mineral industry.

5.5 What is the total value of production that comes about in the *Transport Equipment* sector per unit of primary input in the *Rubber and Plastic* sector? Please also indicate which sector would be considered i and which sector would be considered j, if we were to follow the common nomenclature of IO analysis.

**Answer:** This is found in the G Matrix. Industry i is Rubber and Plastic and Industry j is Transport Equipment. 1 unit of output produced by Rubber and Plastic leads to a total value of production in the Transport Equipment industry of US$0.228.

5.6 Provide the three sectors with the highest direct and indirect forward multipliers:

**Answer:** Forward multipliers are calculated through the row sums of the G Matrix. The top 3 sectors are: Mining and Quarrying; Rubber and Plastics; and Other Non-Metallic Mineral. All basic suppliers of industrial activities.

5.7 Provide the three sectors with the highest direct and indirect backward multipliers:

**Answer:** Backward multipliers are calculated through the column sums of the L Matrix. The top 3 sectors are: Food, Beverages and Tocacco; Coke, Refined Petroleum and Nuclear Fuel; Transport Equipment. Sectors that require multiple inputs to produce their output.

5.8 Plot the scatterplot of averaged forward and backward linkages. What are the sectors with higher linkages (forward and backward)?

**Gráfico, Gráfico de dispersão

O conteúdo gerado por IA pode estar incorreto.**

**Answer:** Some of the sectors with higher linkages are Coke, Refined Petroleum and Nuclear Fuel; Rubber and Plastics; Other Non-Metallic Mineral; Wood and Products of Wood, which are displayed in pink in the upper right of the plot.