Mathematical Programming: Modelling and Applications

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Carelland problem

The independent state of Carelland mainly exports four goods:
steel, engines, electronic components and plastics.

We want to maximize exports and minimize imports.

The unit prices on the world markets for the 4 products are given.
For each product it is also known:
- the number of unities of the other 3 products,
- the price of other imported goods,
- the man-months of work

needed to produce 1 unit of product.

Furthermore:
There is a maximum possible production for electronics and plastic materials.
The total available workforce for each year is known.
Steel, engines, electronics and plastics cannot be imported.

Write a mathematical program that maximizes the gross internal product and solve the problem with AMPL.

Carelland: data

Producing 1 steel unit requires:
0.02 engine units, 0.01 plastics units, 250\$ in imported goods and 6 man-months of work.

Producing 1 engine unit requires:
0.8 steel units, 0.15 electronics units, 0.11 plastics units, 300\$ in imported goods and 1 man-year.

Producing 1 electronics unit requires:
0.01 steel units, 0.01 engine units, 0.05 plastics units, 50\$ in imported goods and 6 man-months.

Producing 1 plastics unit requires:
0.2 steel units, 0.03 engine units, 0.05 electronics units, 300\$ in imported goods and 2 man-years.

Carelland: data

Unit prices on the world markets :

steel	500
engines	1500
electronics	300
plastics	1200

Maximum possible production:

steel	--
engines	--
electronics	650000
plastics	60000

Total available workforce: 830000 man-year.