Design, Interface, Implementation, & Usage of OSCEF

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Contribution

The CIM-EARTH (Community Integrated Model for Energy and Resource Trajectories for Humankind) Framework [3] offers an environment for economic modeling and simulation. Its early version was written in AMPL [2]. To facilitate adoption of CIM-EARTH and integrate data processing and analysis services, we have been moving the implementation from AMPL to C++ and standardizing input and output formats to produce the OSCEF (Open-Source CIM-EARTH Framework) [1]. The core of this framework is a methodology for formulating and solving large-scale computable general equilibrium (CGE) models.

OSCEF currently offers C++ APIs for
- reading & modifying social accounting matrices (SAMs) and production functions
- simulating and solving CGE models.

Architecture

Standardized SAMs

- Read and write description of regions and sectors:
  - Regions regions("regions.csv");
  - Sectors sectors("sectors.csv");

- Read and write SAMs from a directory:
  - SAMS sams("sams7.1");

- Transforming SAMs:
  - Aggregating regions:
    - sams.regionAggregate("map.txt");
  - Aggregating sectors:
    - sams.sectorAggregate("map.txt");

Sample Interfaces

- Disaggregating regions or sectors by proportional splits:
  - string samsPath = "sams7.1";
  - PdnFcn pf("prod.fcn", samsPath);
  - CustUtil cu(samsPath);

- Solve a CGE problem:
  - Cge cge(pf, cu, samsPath);
  - cge.writeMcp();
  - cge.solve();

C++ Classes in OSCEF

- Code Documentation

Release and Support Website

References


Future Work

In the future, we plan to support complete reproducible workflows that include
- simulating dynamic models on high-performance computing resources
- automating parametric sensitivity analyses
- providing analysis and visualization services for the results.

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