

Model Deployment in GAMS

OR/MS-today Advertisements, 1999



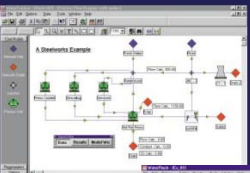
GAMS
Modeling for the real world!

Different


One

Modeling Engine


Industrial water and wastewater minimization
 WaterTarget 1.2™ is an award winning suite of software tools comprising:



WaterPinch™ for rapid production of lean-wide water and containment balances.



WaterPinch™, for selection and design of the best water reuse, re-generation and effluent treatment systems.



For further information about this application, please contact

GAMS Development Corporation
 1217 Potomac Street, N.W.
 Washington, D.C. 20007, USA
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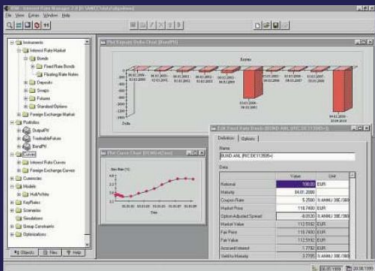
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RiskAdvisor



The RiskAdvisor has been developed to manage portfolios consisting of different interest rate derivatives, foreign exchange instruments and stocks. Beside the valuation functionality you are able to analyze your portfolio via Value at Risk, keyrate deltas and gammas, scenarios, cashflow tables, etc. Optimization models are used to manage risk exposure choosing among different constraints and optimization models. A realtime datafeed (Reuters) ensures an accurate valuation facility using current market prices and risks.

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Markal-Macro



MARKAL-MACRO Overview



Energy Consumption by Sector 2010
 Differentiation, Comparison & Representative Options

Network & Comparison of Technology Costs



MARKAL-MACRO is one of the most widely used energy/environment/economy planning models, playing a central role in Climate Change analysis for numerous countries and communities around the world.

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What characterizes optimization software today?



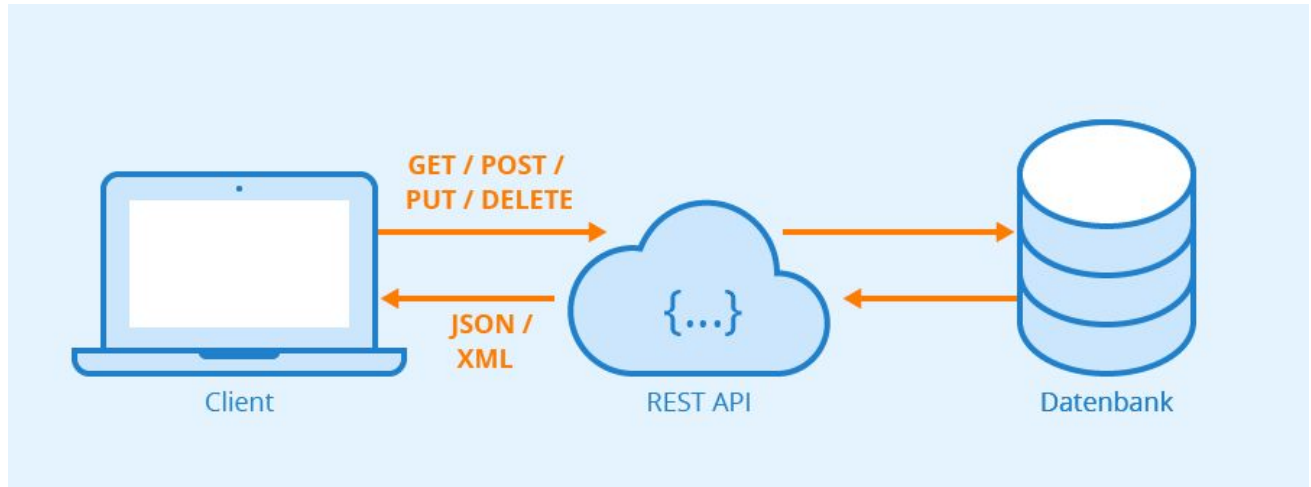
- GUI
 - Rich visualization, performance, user experience, interactivity
 - Online service with user management
 - Platform independent
 - Mobile usage



What characterizes optimization software today?



- Development & Deployment
 - Integration into IT infrastructure / Interfaces to other software
 - Flexible software packages
 - Tendency towards open source software and models



What characterizes optimization software today?



- Computing power
 - Centralized compute resources
 - Solver performance



GAMS Products



GAMS - Modeling Platform

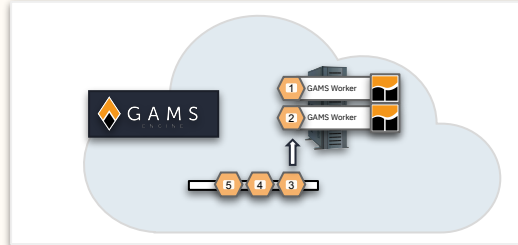
- Platform independent algebraic modeling language
- Connected to a wide range of commercial and academic solvers
- APIs for C++, Java, Python, Matlab,...

```
1  ESI  GAMS  MENU  Tools  View  Help
2  Import GAMS
3
4  Set
5  i 'canning plants' / seattle, san-diego /
6  j 'markets' / new-york, chicago, topeka /;
7
8
9  $onMulti
10 $* SpacksternalInput
11
12 Parameter
13 h(i,j) 'capacity of plant i in cases'
14 / seattle 500
15 / san-diego 400 /;
16
17 h(j,i) 'demand at market j in cases'
18 / new-york 325
19 / chicago 300
20 / topeka 275 /;
21
22 Table d(i,j) 'distance in thousands of miles'
23 / seattle new-york chicago topeka
24 / san-diego 2.5 1.7 1.8
25 /
26 /
27 /
```



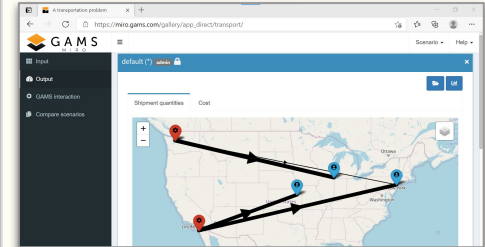
Engine - Deployment Solution

- Solve GAMS models on centralized or cloud resources
- REST API for user & job management
- Built in GAMS job scheduling



MIRO - Graphical UI Generator

- Transformation of models into interactive web applications
- Rich set graphical output options
- Open source, extendable with custom code

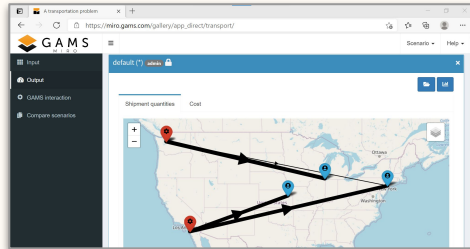


GAMS Products



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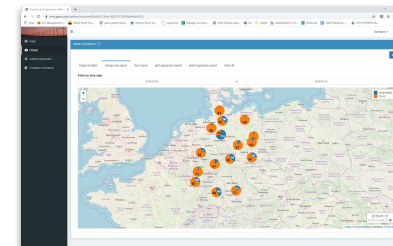
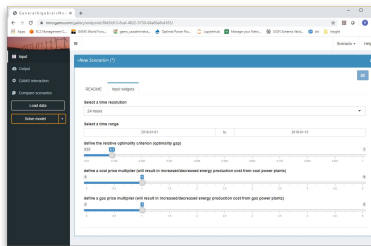


Model Deployment



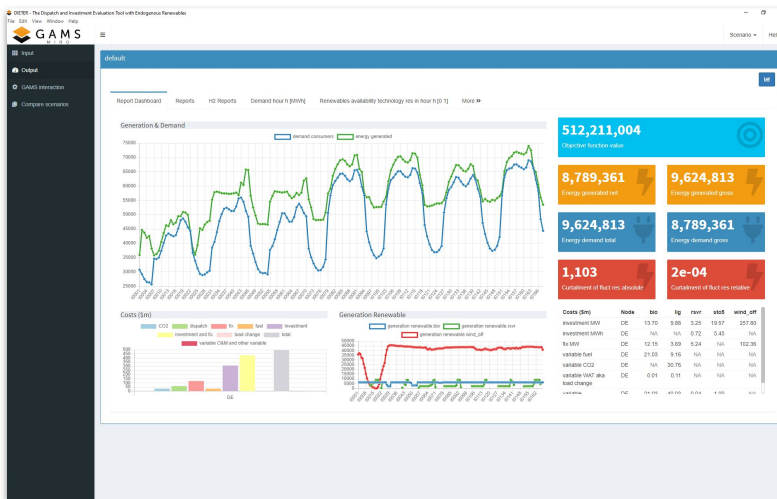
Configuration vs coding

- A few model annotations make GAMS model MIRO ready
- Widgets and graphs can be configured, but do not need to be programmed



Benefits

- Very quick results
- Extendable with custom R code





Model Annotations

```
Set
  i 'canning plants' / seattle, san-diego /
  j 'markets' / new-york, chicago, topeka /;
```

\$onExternalInput

Parameter

```
a(i) 'capacity of plant i in cases'
  / seattle 350
  san-diego 600 /

b(j) 'demand at market j in cases'
  / new-york 325
  chicago 300
  topeka 275 /;
```

Table d(i,j) 'distance in thousands of miles'

```
          new-york  chicago  topeka
seattle   2.5        1.7      1.8
san-diego 2.5        1.8      1.4;
```

Scalar f 'freight in dollars per case per thousand miles'

\$offExternalInput

Parameter c(i,j) 'transport cost in thousands of dollars'

c(i,j) = f*d(i,j)/1000;

\$onExternalOutput

Variable

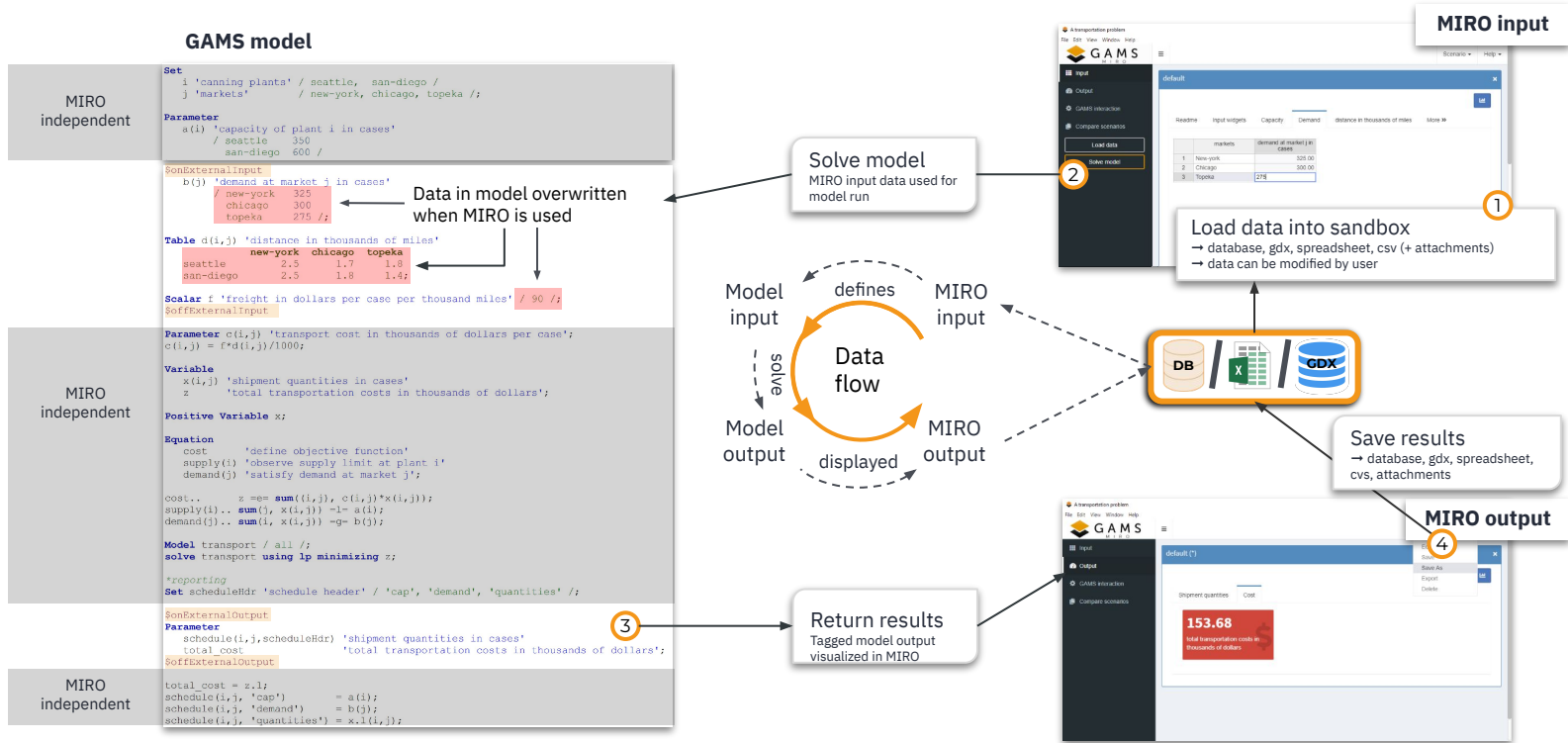
```
x(i,j) 'shipment quantities in cases'
z      'total transportation costs in thousands of dollars'
```

\$offExternalOutput

The screenshot shows the GAMS MISO interface. The sidebar on the left contains the following menu items: Input, Output, GAMS interaction, Load scenarios, and Compare scenarios. At the bottom of the sidebar are two buttons: 'Load data' and 'Solve model'. The main window displays a 'default' scenario with three input fields: 'capacity of plant i in cases', 'demand at market j in cases', and 'distance in thousands of miles'. Below these fields is a table with the following data:

	canning plants	capacity of plant i in cases
1	seattle	350.00
2	san-diego	600.00

GAMS MIRO Data concept





Demo

Development of a MIRO application

Configuration Mode



Help

General settings

Symbols

Tables

Input widgets

Graphs

Scenario analysis

Database management

General settings

User Interface

Scenario Data and Attachments

Job Submission

Log Files

Scenario Comparison

Title and Logo

Application title ¹

Upload a custom logo for your MIRO app ¹

Browse...

No file selected

Logo preview:



Appearance

Color mode ¹

Use system/browser settings

Include a custom CSS file ¹

README File ¹

Include README file

Default Renderers

Generate graphs for each input symbol automatically (pivot tool)

Default renderer for output data

Pivot table

Scenario Comparison



- Input
- Output
- GAMS interaction
- Load scenarios
- Compare scenarios

Split view ▾

Synchronize tabs

default
×

2022-09-01 16:25:07

Demand/Surplus report
Cost report
Reactor/Product report
Output Variable/Equation Scalars
compute surplus production p
More >>

Filter

Header

number of batches ▾

Load view ▾

Stacked bar chart ▾

Product

Header

number of batches ▾

Aggregate

Sum ▾

Reactor

All

Scen2 (Sandbox)
×

2022-09-01 16:26:17

Demand/Surplus report
Cost report
Reactor/Product report
Output Variable/Equation Scalars
compute surplus production p
More >>

Filter

Header

number of batches ▾

Load view ▾

Stacked bar chart ▾

Product

Header

number of batches ▾

Aggregate

Sum ▾

Reactor

All

Scenario ▾
Help ▾

- Split view
- Tab View
- Pivot Compare
- Custom Analysis



Hypercube Mode (requires GAMS Engine)

New Hypercube job

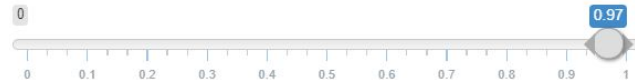
You have selected 160 scenarios to be solved in Hypercube mode. Of these, 0 scenarios have already been solved either by yourself or by someone else.

Assign one or more tags to your job:

freight in dollars per case per thousand miles

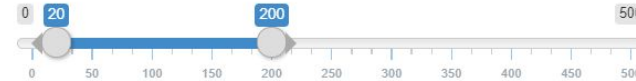


beta (MINLP-only)



Step size

minimum shipment (MIP- and MINLP-only)



Step size

Step size

Select the model type

Submit all

Cancel

- Execution of automatically generated scenarios
- Scalar Widgets automatically expanded
- Scenarios can be solved in parallel with Engine

Custom Code Implementation



Model Setup | Closure | Numeraire Check | Technical Setup

Modules: Policy Instruments

Local Content Requirement (LCR) Module

Price Preference Module

Willingness to Pay Module

Other Modules

Intermediate Input Nesting Module

Capital Accumulation

Elasticities

Armington Elasticities: GTAP

Export Elasticities: GTAP

Production Substitution Elasticities first nest: GTAP

Production Substitution Elasticities second nest: GTAP

Dashboard | Crop Comparison Deterministic vs. Stochastic | Financial Report by Scenario | Crop Report

PROFIT 111.749€

REVENUE 226.261€

COST 114.512€

LANDUSE 100%

Profit by Scenario

Crop Planted [acres]

Setting	Value
Yield Factor	1
Available Land [acre]	500
Number of Scenarios	500
Yield Factor Standard Deviation	NA

Crop Report

Yield / Planted / Seed Cost | Sales / Purchases

Crop Yield [tons]

Crop Planted [acres]

Seed Cost [€]

Custom R Code Implementations for

- Renderers
- Input Widgets
- Scenario Analysis
- Data Connectors (Im-/Export)

Contact Us

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www.gams.com



[@GamsSoftware](https://twitter.com/GamsSoftware)



<https://www.linkedin.com/company/gams-development>

Other OR 2022 talks:

- *Scalable Optimization in the Cloud with GAMS and GAMS Engine*
WB-13
Wednesday, 10:30-12:00
- *Research & Development Activities at GAMS*
TB-13
Thursday, 10:00-11:30

Visit us at our booth!



MODEL – SOLVE – DEPLOY