


An Introduction to GAMS with GAMS Studio


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Outline

- Introduction
- GAMS licence
- Installing GAMS & GAMS Studio
- Running a First GAMS Programme
- Testing a GAMS/GAMS Studio Installation
- Using a GAMS Model Library
- Configuring GAMS Studio

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Introduction

- General Algebraic Modeling System (GAMS)
 - High level programming language
 - Mostly used to solve optimisation problems
 - Allows preparation of transparent programmes
- GAMS consists of
 - Base Module
 - Series of solvers
 - GAMS Studio (or GAMSIDE)


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Introduction


- GAMS
 - allows use of specialised solvers without knowledge their syntax;
 - separates data and the logic of a problem;
 - a GAMS programme is its own documentation; and
 - looks after a number of common programming problems, e.g., dimensionality.
- “GAMS was developed to [overcome a series of mathematical programming problems] by
 - Providing a high-level language for the compact representation of large and complex models
 - Allowing changes to be made in model specifications simply and safely
 - Allowing unambiguous statements of algebraic relationships
 - Permitting model descriptions that are independent of solution algorithms” (Brooke *et al.*, 1998, p1).


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Introduction

- This course
 - Requires the demo/student version of GAMS that is free from the GAMS website;
 - Uses GAMS Studio as the editor programme;
 - The documentation assumes the user is using a PC with the Windows operating system
 - GAMS and GAMS Studio are available for MacOS and Linux based systems



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GAMS Demo Licence

Go to: https://www.gams.com/try_gams/

Try before you buy

Evaluate our software before making a purchase. We offer the following options:

DEMO LICENSE

For commercial, academic, and non-profit users.


Our demo licenses are valid for 12 months, and are ideal for those who want to get a first impression of GAMS.

All language features are enabled, and the restrictions listed below are quite generous. You will be able to run your first experiments before hitting the limits too soon.

- You can generate and solve linear models (LP, RMP, and MIP) that do not exceed 2000 variables and 2000 constraints
- For all other model types the model cannot be larger than 1000 variables and 1000 constraints
- Some solvers might enforce additional limits for the demo license. Read the licensing chapter of the GAMS online documentation for more information.
- GAMS will terminate with a licensing error if you hit one of the above limits:
 *** Status: Terminated due to a licensing error *** Inspect listing file for more information
- MIRO connector allows up to 10 indexed input and output symbols
- Limited to 12 months

Request a Free Demo License

<input type="text"/>	<input type="text"/>	<input type="text"/>
<small>First Name*</small>	<small>Last Name*</small>	<small>Email*</small>
<input type="text"/>		<input type="text"/>
<small>Institute/Organisation*</small>		<small>Country</small>
<input type="text"/>		<input type="text" value="Holy See"/>



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www.gams.com/download/

GAMS

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Download GAMS Release 40.2.0
Released September 01, 2022

Please consult the [release notes](#) before downloading a system. We also have [detailed platform descriptions](#) and [installation notes](#). The GAMS distribution includes the documentation in electronic form.

MS Windows Desktop and Server Operating Systems ¹	GNU/Linux Systems	Package Installer for Mac ³
x86_64 architecture	x86_64 architecture	x86_64 architecture
MD5 hash ² 8028102886571a87886579d27584	MD5 hash ² 470284f432781f882d588d8781c71	MD5 hash ² a3882492811398681a278a470
Download	Download	Download

¹The SmartScreen Filter on Microsoft Windows might give a warning during the installation. For more information please check our [Documentation](#).

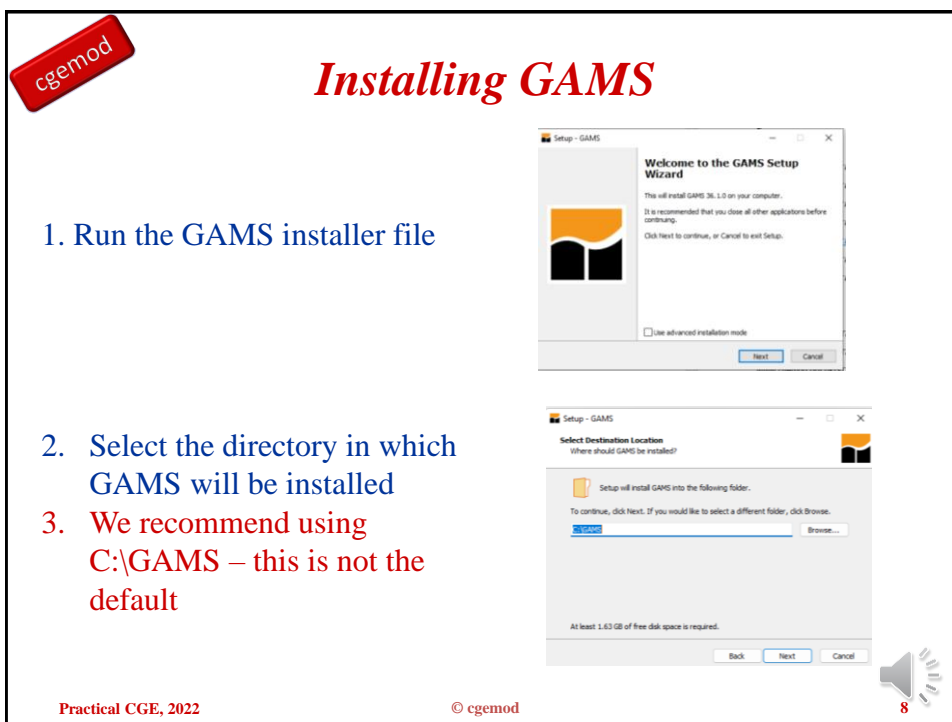
²Use a program like md5sum to verify. This should come preinstalled on most Linux systems. On Windows systems, open a powershell and enter `cmd /c md5sum -s windows_x86_64.exe -41gr1m8`. On Mac OS systems you can use md in the terminal.

³For Mac OS X, also a simple self-extracting archive is available, which you can download [here](#). Note, that this archive does not contain GAMS Studio. The md5 hash for this download is `50c78e3c959e9c7a5e802323e8`.

1. Get the GAMS programme from the GAMS web site
 - Save the file (e.g., **windows_x64_64.exe**) on your PC
2. The Linux and Mac OS versions support GAMS Studio
3. The instructions in this presentation refer to the Windows version & GAMS Studio

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Installing GAMS

1. Run the GAMS installer file
2. Select the directory in which GAMS will be installed
3. We recommend using **C:\GAMS** – this is not the default

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Installing GAMS 2

4. Select GAMS Studio as the editor
5. Select 'Browse for license file'
6. Complete the GAMS Setup Wizard choose - 'Launch GAMS Studio'

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Using GAMS Studio: Projects

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Using GAMS Studio: Projects

The screenshot shows the GAMS Studio interface. The Project Explorer on the left shows a project named 'transport' containing a file 'transport.gms'. The main editor window displays the code for 'transport.gms', which includes comments and GAMS code. A red circle highlights the 'transport' project and 'transport.gms' file in the Project Explorer.

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Testing GAMS and GAMS Studio

Run `transport.gms`: select `GAMS>Run` with GDX Creation OR F10

```

Version identifier: 22.1.0.0 | 2022-03-09 | 1a383f58ce
CPXPARAM_Advance 0
CPXPARAM_Simplex_Display 2
CPXPARAM_Threads 1
CPXPARAM_MIP_Display 4
CPXPARAM_MIP_Fool_Capacity 0
CPXPARAM_MIP_Tolerances_AbsMIPGap 0
Tried aggregator 1 time.
LP Presolve eliminated 0 rows and 1 columns.
Reduced LP has 5 rows, 6 columns, and 12 nonzeros.
Presolve time = 0.00 sec. (0.00 ticks)

Iteration   Dual Objective      In Variable      Out Variable
  1          73.1250000    x(seattle,new-york) demand(new-york) slack
  2          119.0250000    x(seattle,chicago) demand(chicago) slack
  3          153.6750000    x(san-diego,topeka) demand(topeka) slack
  4          153.6750000    x(san-diego,new-york) supply(seattle) slack

--- LP status (1): optimal.
--- Cplex Time: 0.00sec (det. 0.01 ticks)

Optimal solution found
Objective:      153.675000

--- Reading solution for model transport
--- Executing after solve: elapsed 0:00:00.098
--- transport.gms(66) 4 Mb
--- RefFile C:\Users\jrmc\OneDrive\Documents\GAMS\Studio\workspace\transport.ref
--- GDX File C:\Users\jrmc\OneDrive\Documents\GAMS\Studio\workspace\transport.gdx
*** Status: Normal completion
--- Job transport.gms Stop 09/07/22 16:33:15 elapsed 0:00:00.099
  
```

The terminal output shows the execution of the GAMS model. The optimal solution is found with an objective value of 153.675000. A red circle highlights the 'Optimal solution found' and 'Objective: 153.675000' lines.

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Test Directory

Right-click on the project label
Choose 'Open Location'

Location path

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Testing GAMS and GAMS Studio

Six programmes from the GAMS Model Library used

1. `transport` (LP :objective value: 153.675)
2. `chenery` (NLP: objective value: 1058.9)
3. `bid` (MIP: optimal solution: 15210109.512)
4. `procsel` (MINLP: optimal solution: 1.9231)
5. `scarfmcp` (MCP: no objective function)

- Select each programme in turn from the model library.
- In turn set each programme the main file
 - Right click on the respective gms file and select **Set as main file**
- Run each programme
 - use GAMS>Run with GDX Creation OR F10
- Check each returns an optimal solution

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Model Library

In Studio select: GAMS>Model Library Explorer OR F6

SeqNr	Lic	Name	Application Area	Type	Description
064	D	ABEL	Macro Economics	NLP	Linear Quadratic Control Problem
208	D	ABSMIP	Mathematics	MIP	Discontinuous functions abs() min() max() sign() as MIPs
088	D	AGRESTE	Agricultural Economics	LP	Agricultural Farm Level Model of NE Brazil
008	D	AIRCRAFT	Management Science and OR	LP	Aircraft Allocation Under Uncertain Demand
189	C	AIRSP	Stochastic Programming	LP	Aircraft Allocation
196	C	AIRSP2	Stochastic Programming	DECIS	Aircraft Allocation - stochastic optimization with DECIS
060	D	AJAX	Management Science and OR	LP	Ajax Paper Company Production Schedule
124	D	ALAN	Finance	MINLP	A Quadratic Programming Model for Portfolio Analysis
165	D	ALKYL	Chemical Engineering	NLP	Simplified Alkylation Process
396	D	ALLBASES	Micro Economics	MIP	Enumerate all Feasible Basic Solutions of the Transportation Problem
170	D	ALPHA...	Recreational Models	MIP	Alphametics - a Mathematical Puzzle
031	C	ALUM	International Trade	MIP	World Aluminum Model
074	D	AMPL	Management Science and OR	LP	AMPL Sample Problem
044	L	ANDEAN	Micro Economics	MIP	Andean Fertilizer Model
197	D	APLP	Stochastic Programming	DECIS	Stochastic Programming Example for DECIS
198	D	APLP2	Stochastic Programming	DECIS	Stochastic Programming Example for DECIS
430	D	ASYNCL...	GAMS Language Features	MIP	Asynchronous processing of incumbents reported by GAMS/CPLEX
403	L	ASYNCL...	GAMS Language Features	GAMS	Execute asynchronously several GAMS jobs and collect the fastest
411	D	ASYNCL...	GAMS Language Features	LP	Transportation Problem with async loop body execution
296	D	AWKQAP	GAMS Tools	MIQP	Input file generation with AWK for the Quadratic Assignment Problem
308	D	AWKTSR	GAMS Tools	MIP	Traveling Salesman Problem Instance generated with AWK

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Workspace Directory

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Configuring GAMS Studio

1. Choose File>settings OR F7
 - Opens the settings
2. Choose General tab
3. NB the path for the Default GAMS Studio Workspace
4. Leave the defaults settings
 - Check that 'Open file in current project by default' is selected
5. Some on these settings may change later




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Configuring GAMS Studio

1. Choose Editor & Log tab
2. Set font to Courier New
3. Set the font size
4. Leave the other settings for now
 - Some on these settings may change later



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The End

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