

# A Quick Introduction to GAMS

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# Introduction

- Once we have trade data, we need a method for manipulating the data into a usable form.
- Depending on what we want to do with the data there are many options. For small problems, a simple program like Microsoft Excel is likely to be sufficient.
- For problems involving more complex manipulations of larger datasets, more powerful software is needed.
- We will be developing a series of programs using GAMS. GAMS has powerful data manipulation capabilities, and is also a platform within which complex models can be developed.
- In this session we provide some basic notes to get you started with the GAMS system. We'll introduce more complex features as we proceed.

# What is GAMS?

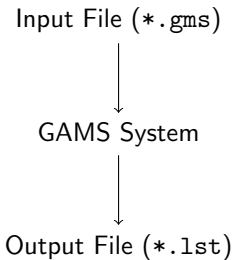
- GAMS is an acronym that stands for the General Algebraic Modeling System.
- It is a high level programming language designed for data manipulation, and building and solving mathematical models numerically.
- GAMS can solve a wide variety of problems, and is capable of handling very large mathematical systems.
- It is in very widespread use in both the academic and business worlds.

# Getting and Installing GAMS

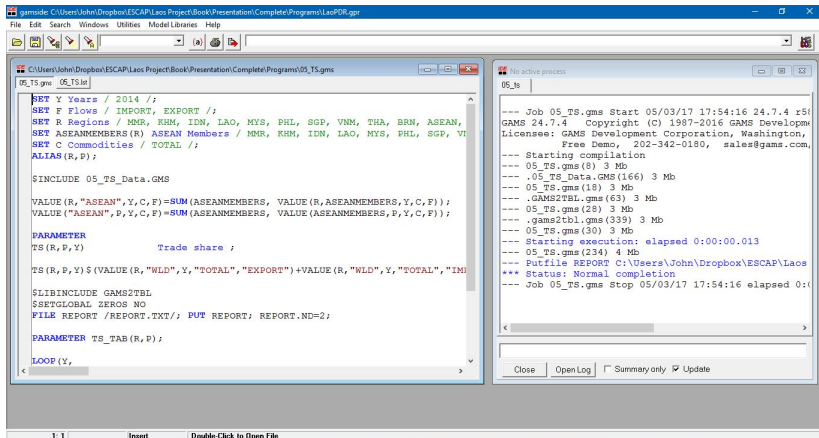
- GAMS Corporation provides a student/demonstration version free of charge, which is suitable for small models.
- The latest version can be downloaded for various platforms from <http://www.gams.com/download/>.
- Once the file has downloaded, double click on it to start the installation process. A prompt will appear asking if you wish to copy a license file. You can click no (without the license file GAMS will run in student/demonstration mode).
- Once it has installed, GAMS will ask if you want to launch the IDE, or integrated development environment. This is the main GAMS interface. Click yes and GAMS should appear.

# A Quick GAMS Primer

- A GAMS program is a text file that describes the model structure in terms of its component variables, parameters and relationships. The text file is usually given the suffix `gms`.
- To run the program, the text file is submitted to the GAMS system. GAMS then checks for syntax errors and undertakes the instructions.
- It then reports back the results in a list file (with the suffix `lst`).



# GAMSIDE



- In order to use data in a GAMS program, we need to convert it into a format that GAMS can use.
- The process is a bit tedious – but not very difficult.
- We can use Excel to make the necessary changes.
- The process can be illustrated with an example. We'll use Cambodia's exports by HS 2-digit category in 2014.
- Consider the files `04_Data_Example.csv` (original data), `04_Data_Example.xlsx` (cleaned Excel version), and `04_Data_Example.gms` (GAMS format).



# GAMS Data Formatting Steps

- 1 Download a COMTRADE or WITS query in CSV format. Open the file in Excel and delete any unnecessary columns.
- 2 On the right hand side of the sheet, create a new column containing a reference to the identifying information for each data element in GAMS format. This is just a list of the identifying elements from each set of the data array, separated by a dot. We will use the order reporter, partner, year, commodity, then flow. In our example, in cell AL2 we type =K2&"."&N2&"."&B2&"."&V2&"."&H2.
- 3 In the next column, replicate the trade flow data. In our example we would type =AF2.
- 4 Drag both columns down to complete a relative paste operation for all of the data items.
- 5 Copy the data into a plain text file. Above the data enter the expression: `PARAMETER VALUE (R,P,Y,C,F) /`, and below the data enter `/;`
- 6 Save the text file with the extension GMS.

# Further Resources

- There is lots more to know about GAMS. We'll learn as we go.
- Further details on GAMS can be found in the GAMS User's Guide. The GAMS User's Guide contains a tutorial (chapter 2) that is a useful starting point for basic programming in GAMS.
- Zenios (1996) is another useful reference on the capabilities of GAMS.
- Bruce McCarl also has an online reference to GAMS that has very useful programming advice.