

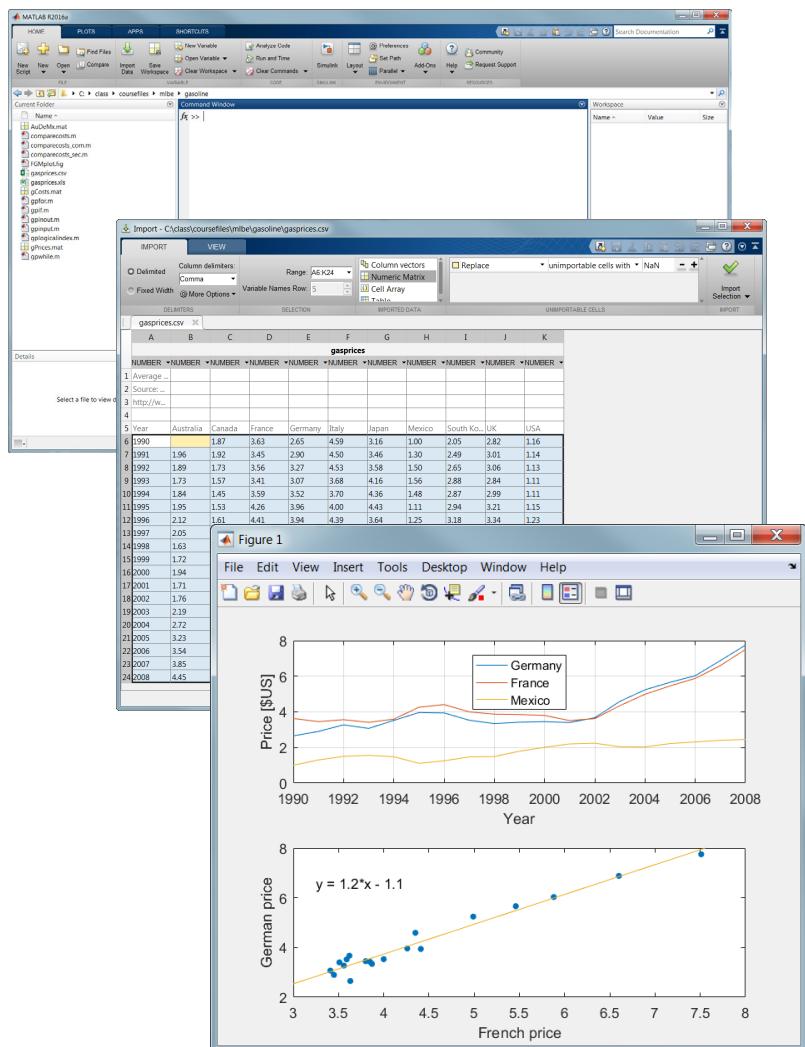
Working with the MATLAB® User Interface

MATLAB® Fundamentals for Aerospace Applications

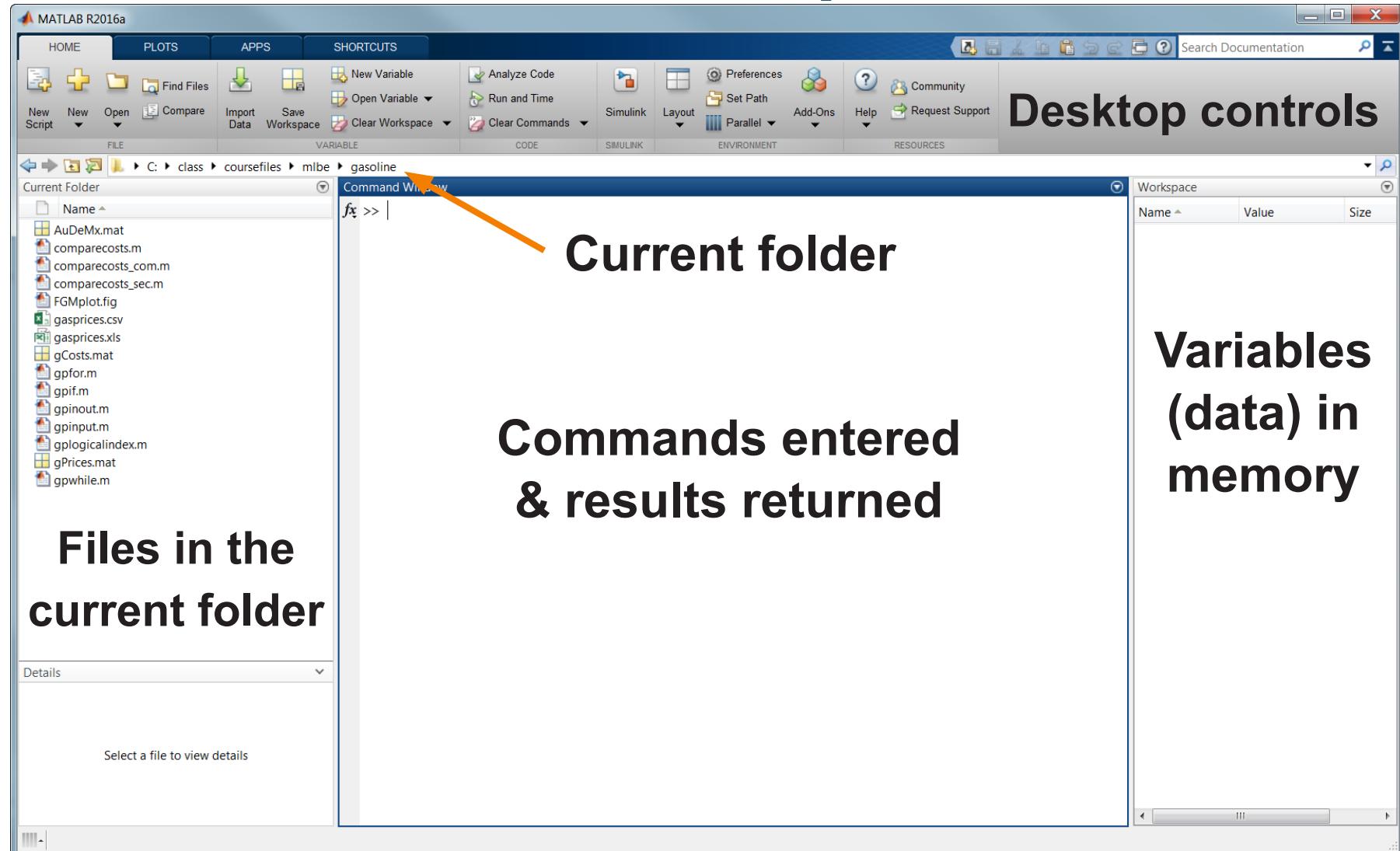


Outline

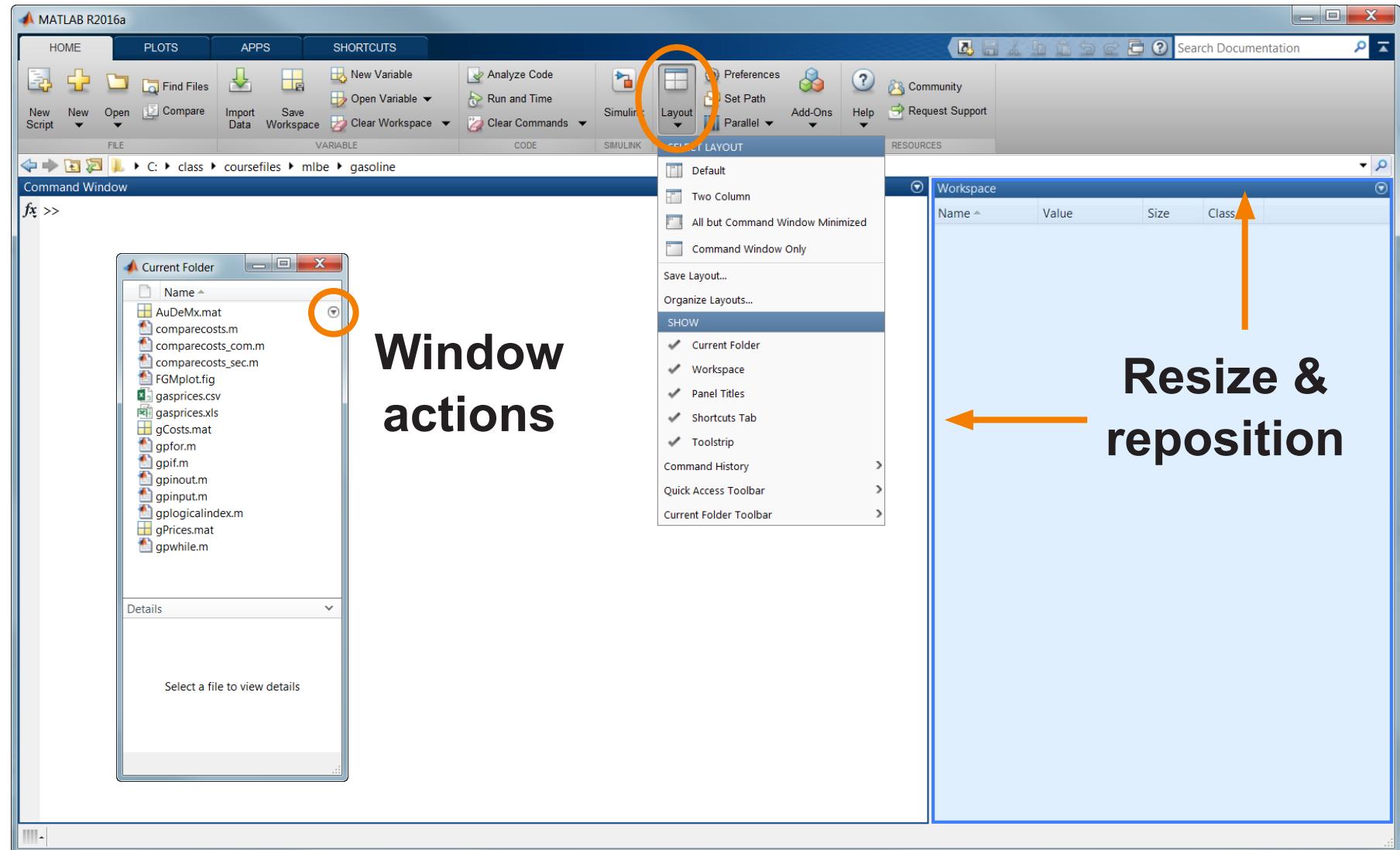
- Navigating the interface
- Reading data from file
- Saving and loading variables
- Creating custom plots
- Exporting graphics for use in other applications



The MATLAB® Desktop



Customizing the Desktop



Course Example: Gasoline Price Data

C:\class\coursefiles\mlbe\gasoline\

The screenshot shows the MATLAB Current Folder browser on the left and a spreadsheet on the right. The browser lists several files, with 'gasprices.csv' highlighted. An orange arrow points from the 'gasprices.csv' entry in the browser to the corresponding row in the spreadsheet.

Average Annual Gasoline (Petrol) Retail Prices in Selected Countries [\$US per gallon]

Source: US Dept. of Energy
<http://www.eia.doe.gov/emeu/aer/txt/ptb1108.html>

Year	Australia	Canada	France	Germany	Italy	Japan	Mexico	South Korea	UK	USA
1990		1.87	3.63	2.65	4.59	3.16	1	2.05	2.82	1.16
1991	1.96	1.92	3.45	2.9	4.5	3.46	1.3	2.49	3.01	1.14
1992	1.89	1.73	3.56	3.27	4.53	3.58	1.5	2.65	3.06	1.13
1993	1.73	1.57	3.41	3.07	3.68	4.16	1.56	2.88	2.84	1.11
1994	1.84	1.45	3.59	3.52	3.7	4.36	1.48	2.87	2.99	1.11
1995	1.95	1.53	4.26	3.96	4	4.43	1.11	2.94	3.21	1.15
1996	2.12	1.61	4.41	3.94	4.39	3.64	1.25	3.18	3.34	1.23
1997	2.05	1.62	4	3.53	4.07	3.26	1.47	3.34	3.83	1.23
1998	1.63	1.38	3.87	3.34	3.84	2.82	1.49	3.04	4.06	1.06
1999	1.72	1.52	3.85	3.42	3.87	3.27	1.79	3.8	4.29	1.17
2000	1.94	1.86	3.8	3.45	3.77	3.65	2.01	4.18	4.58	1.51
2001	1.71	1.72	3.51	3.4	3.57	3.27	2.2	3.76	4.13	1.46
2002	1.76	1.69	3.62	3.67	3.74	3.15	2.24	3.84	4.16	1.36
2003	2.19	1.99	4.35	4.59	4.53	3.47	2.04	4.11	4.7	1.59
2004	2.72	2.37	4.99	5.24	5.29	3.93	2.03	4.51	5.56	1.88
2005	3.23	2.89	5.46	5.66	5.74	4.28	2.22	5.28	5.97	2.3
2006	3.54	3.26	5.88	6.03	6.1	4.47	2.31	5.92	6.36	2.59
2007	3.85	3.59	6.6	6.88	6.73	4.49	2.4	6.21	7.13	2.8
2008	4.45	4.08	7.51	7.75	7.63	5.74	2.45	5.83	7.42	3.27

Interactive Importing

The screenshot illustrates the process of importing a CSV file into MATLAB. It shows three main windows:

- Current Folder Browser:** Shows files like AuDeMx.mat, comparecosts.m, and gasprices.csv. A context menu is open over gasprices.csv, with "Import Data..." highlighted by an orange arrow.
- Import Tool:** An "Import" dialog box for "gasprices.csv". It shows the file path C:\class\coursefiles\mlbe\gasoline\gasprices.csv. Under "IMPORT", "Delimited" is selected with "Comma" as the delimiter. The "Range" is set to A6:K24. Under "IMPORTED DATA", "Numeric Matrix" is selected, which is also highlighted by an orange circle. Other options include "Column vectors", "Cell Array", and "Table".
- Workspace Browser:** Shows the variable "gasprices" as a 19x11 double array.

Arrows indicate the flow from the file selection in the Current Folder browser to the Import tool, and from the imported data in the Import tool to the final workspace variable.

Year	Australia	Canada	France	Germany	Italy	Japan	Mexico	South Ko...	UK	USA
1990	1.87	3.63	2.65	4.59	3.16	1.00	2.05	2.82	1.16	
1991	1.96	1.92	3.45	2.90	4.50	3.46	1.30	2.49	3.01	1.14
1992	1.89	1.73	3.56	3.27	4.53	3.58	1.50	2.65	3.06	1.13
1993	1.73	1.57	3.41	3.07	3.68	4.16	1.56	2.88	2.84	1.11
1994	1.84	1.45	3.59	3.52	3.70	4.36	1.48	2.87	2.99	1.11
1995	1.95	1.53	4.26	3.96	4.00	4.43	1.11	2.94	3.21	1.15
1996	2.12	1.61	4.41	3.94	4.39	3.64	1.25	3.18	3.34	1.23
1997	2.05	1.62	4.00	3.53	4.07	3.26	1.47	3.34	3.83	1.23
1998	1.63	1.38	3.87	3.34	3.84	2.82	1.49	3.04	4.06	1.06
1999	1.72	1.52	3.85	3.42	3.87	3.27	1.79	3.80	4.29	1.17
2000	1.94	1.86	3.80	3.45	3.77	3.65	2.01	4.18	4.58	1.51
2001	1.71	1.72	3.51	3.40	3.57	3.27	2.20	3.76	4.13	1.46
2002	1.76	1.69	3.62	3.67	3.74	3.15	2.24	3.84	4.16	1.36
2003	2.19	1.99	4.35	4.59	4.53	3.47	2.04	4.11	4.70	1.59
2004	2.72	2.37	4.99	5.24	5.29	3.93	2.03	4.51	5.56	1.88
2005	3.23	2.89	5.46	5.66	5.74	4.28	2.22	5.28	5.97	2.30
2006	3.54	3.26	5.88	6.03	6.10	4.47				
2007	3.85	3.59	6.60	6.88	6.73	4.49				
2008	4.45	4.08	7.51	7.75	7.63	5.74				

Variables in the Base Workspace

19

The screenshot shows the MATLAB Workspace browser window. A variable named 'gasprices' is listed. The 'Value' column shows a 19x11 matrix of numeric data. The 'Size' column indicates it is a 19x11 matrix, and the 'Class' column indicates it is of type 'double'. A vertical orange bracket on the left side of the data table groups the first 19 columns, and a horizontal orange bracket at the bottom groups the last 11 columns. An orange arrow points from the 'Size' and 'Class' labels down to the corresponding columns in the data table.

Name	Value	Size	Class
gasprices	19x11 double	19x11	double

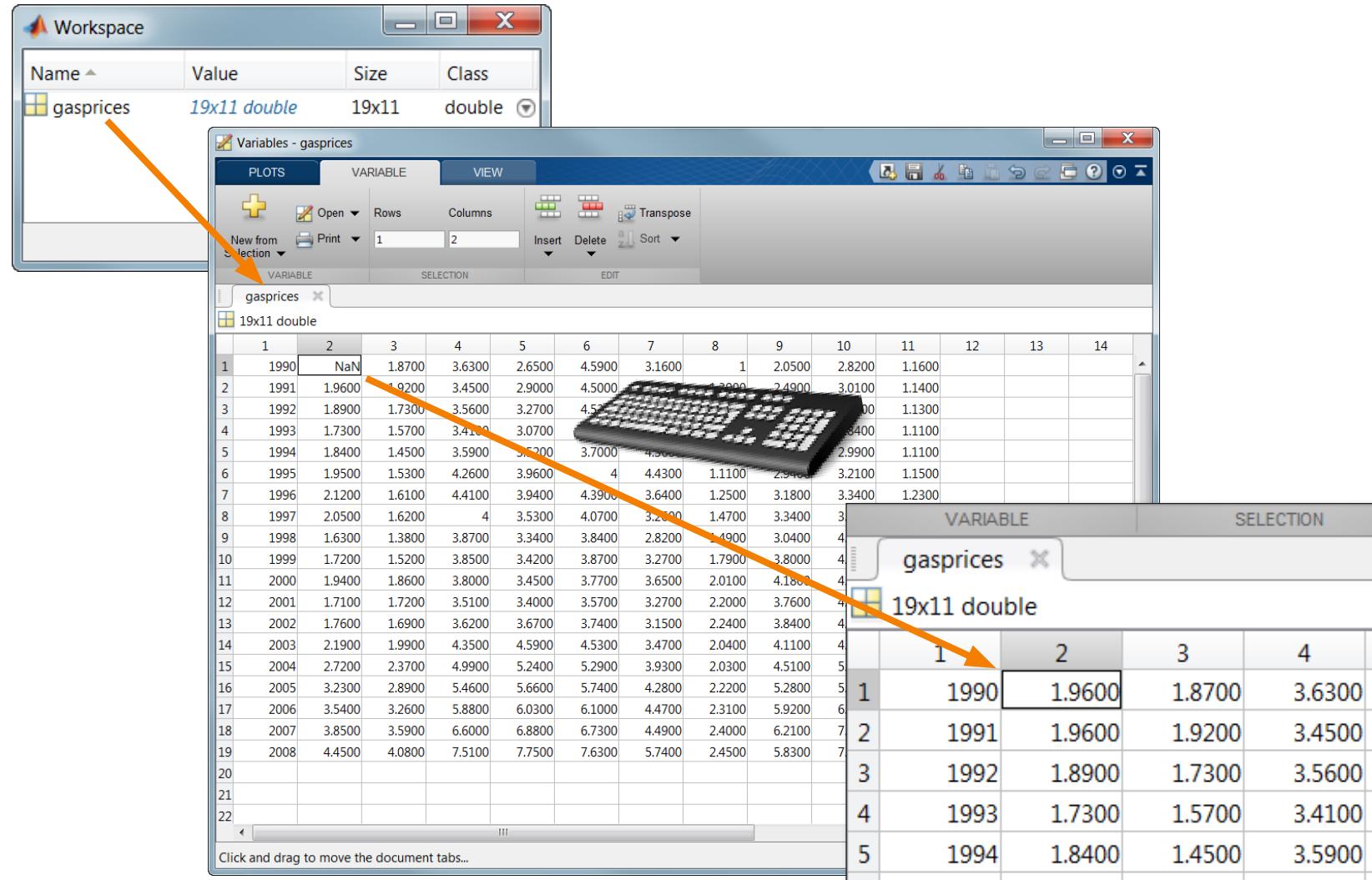
11

A 19x11 matrix of numeric data representing gas prices. The first 19 columns are grouped by a vertical orange bracket on the left, and the last 11 columns are grouped by a horizontal orange bracket at the bottom. The data spans from 1990 to 2008. An orange circle highlights the value '1.59' in the 2003 row, 11th column position. An orange arrow points from this highlighted value to the text 'Numeric data → "double precision"'.

1990	NaN	1.87	3.63	2.65	4.59	3.16	1	2.05	2.82	1.16
1991	1.96	1.92	3.45	2.9	4.5	3.46	1.3	2.49	3.01	1.14
1992	1.89	1.73	3.56	3.27	4.53	3.58	1.5	2.65	3.06	1.13
1993	1.73	1.57	3.41	3.07	3.68	4.16	1.56	2.88	2.84	1.11
1994	1.84	1.45	3.59	3.52	3.7	4.36	1.48	2.87	2.99	1.11
1995	1.95	1.53	4.26	3.96	4	4.43	1.11	2.94	3.21	1.15
1996	2.12	1.61	4.41	3.94	4.39	3.64	1.25	3.18	3.34	1.23
1997	2.05	1.62	4	3.53	4.07	3.26	1.47	3.34	3.83	1.23
1998	1.63	1.38	3.87	3.34	3.84	2.82	1.49	3.04	4.06	1.06
1999	1.72	1.52	3.85	3.42	3.87	3.27	1.79	3.8	4.29	1.17
2000	1.94	1.86	3.8	3.45	3.77	3.65	2.01	4.18	4.58	1.51
2001	1.71	1.72	3.51	3.4	3.57	3.27	2.2	3.76	4.13	1.4
2002	1.76	1.69	3.62	3.67	3.74	3.15	2.24	3.84	4.16	1.5
2003	2.19	1.99	4.35	4.59	4.53	3.47	2.04	4.11	4.7	1.59
2004	2.72	2.37	4.99	5.24	5.29	3.93	2.03	4.51	5.56	1.88
2005	3.23	2.89	5.46	5.66	5.74	4.28	2.22	5.28	5.97	2.3
2006	3.54	3.26	5.88	6.03	6.1	4.47	2.31	5.92	6.36	2.59
2007	3.85	3.59	6.6	6.88	6.73	4.49	2.4	6.21	7.13	2.8
2008	4.45	4.08	7.51	7.75	7.63	5.74	2.45	5.83	7.42	3.27

Numeric data → "double precision"

The Variable Editor



New Variables

The screenshot illustrates the process of creating new variables in the MATLAB workspace. It shows three windows: the Variables browser, the top-level Workspace browser, and a bottom-level Workspace browser.

Variables - gasprices (Left Window): This window displays a table of data for 'gasprices'. A right-click context menu is open over the first row of the table, with the 'New Numeric Array' option highlighted by a yellow arrow. The table data is as follows:

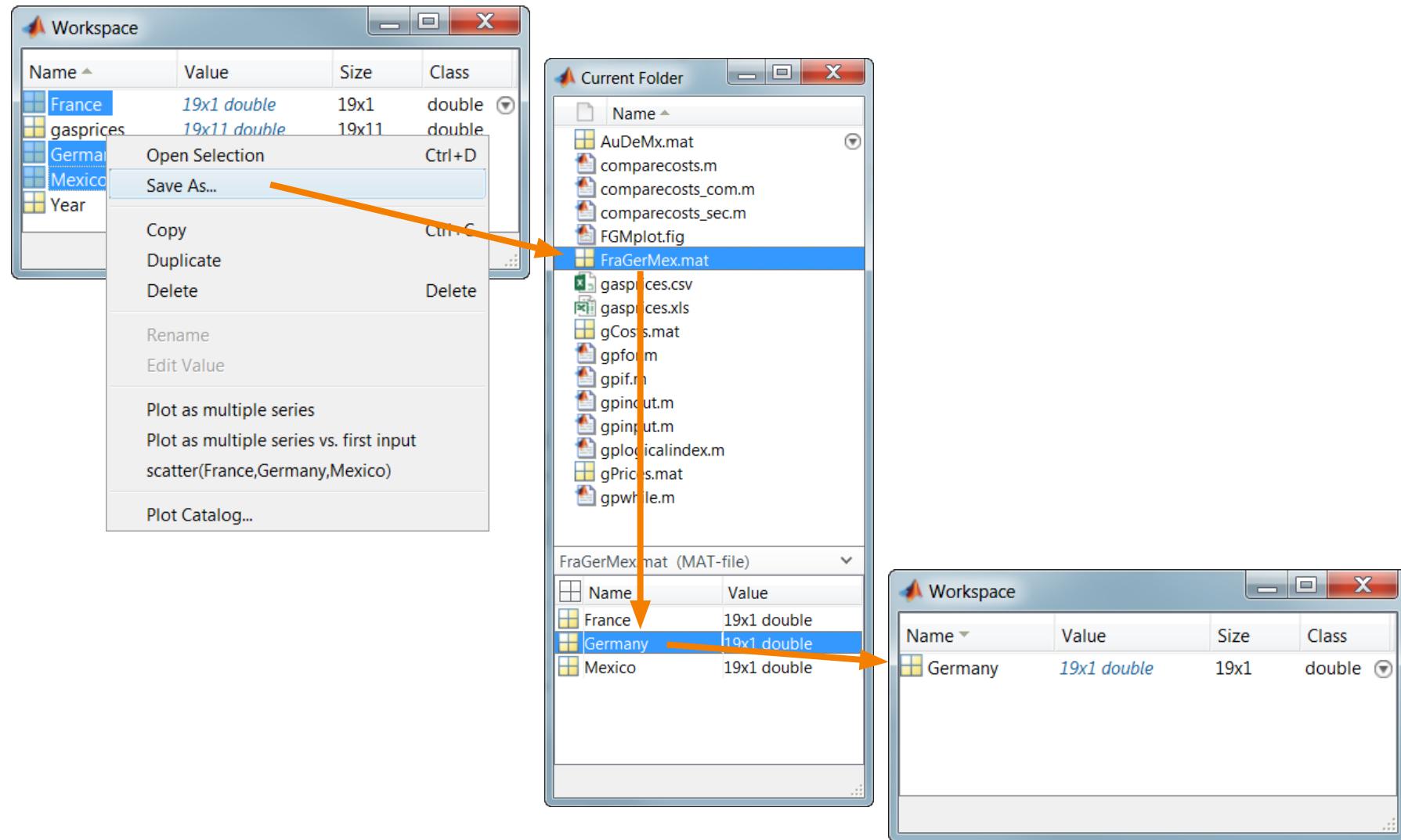
	1	2	3	4	5	6	7	8	9	10
1	1990	Nan	1.8700	3.6300	2.6500	4.5900	3.1600	1	2.0500	2.8200
2	1991	1.9600	1.9200	3.4500	2.9000	4.5000	3.4600	1.3000	2.4900	3.0100
3	1992	1.8900	1.7300	3.5600	3.2700	4.5300	3.5800	1.5000	2.6500	3.0600
4	1993	1.7300	1.5700	3.4100	3.0700	3.6800	4.1600	1.5600	2.8800	2.8400
5	1994	1.8400	1.4500	3.5900	3.5200	3.7000	4.3600	1.4800	2.8700	2.9900
6	1995	1.9500	1.5300	4.2600	3.9600	4	4.4300	1.1100	2.9400	3.2100
7	1996	2.1200	1.6100	4.4100	3.9400	4.3900	3.6400	1.2500	3.1800	3.3400
8	1997	2.0500	1.6200	4	3.5300	4.0700	3.2600	1.4700	3.3400	3.8300
9	1998	1.6300	1.3800	3.8700	3.3400	3.8400	2.8200	1.4900	3.0400	4.0600
10	1999	1.7200	1.5200	3.8500	3.4200	3.8700	3.2700	1.7900	3.8000	4.2900
11	2000	1.9400	1.8600	3.8000	3.4500	3.7700	3.6500	2.0100	4.1800	4.5800
12	2001	1.7100	1.7200	3.5100	3.4000	3.5700	3.2700	2.2000	3.7600	4.1300
13	2002	1.7600	1.6900	3.6200	3.6700	3.7400	3.1500	2.2400	3.8400	4.1600
14	2003	2.1900	1.9900	4.3500	4.5900	4.5300	3.4700	2.0400	4.1100	4.7000
15	2004	2.7200	2.3700	4.9900	5.2400	5.2900	3.9300	2.0300	4.5100	5.5600
16	2005	3.2300	2.8900	5.4600	5.6600	5.7400	4.2800	2.2200	5.2800	5.9700
17	2006	3.5400	3.2600	5.8800	6.0300	6.1000	4.4700	2.3100	5.9200	6.3600
18	2007	3.8500	3.5900	6.6000	6.8800	6.7300	4.4900	2.4000	6.2100	7.1300
19	2008	4.4500	4.0800	7.5100	7.7500	7.6300	5.7400	2.4500	5.8300	7.4200
20										

Workspace (Top Right Window): This window shows the current workspace variables. The variable 'gasprices' is selected, and a context menu is open, with 'New Numeric Array' highlighted by a yellow arrow. The menu options include:

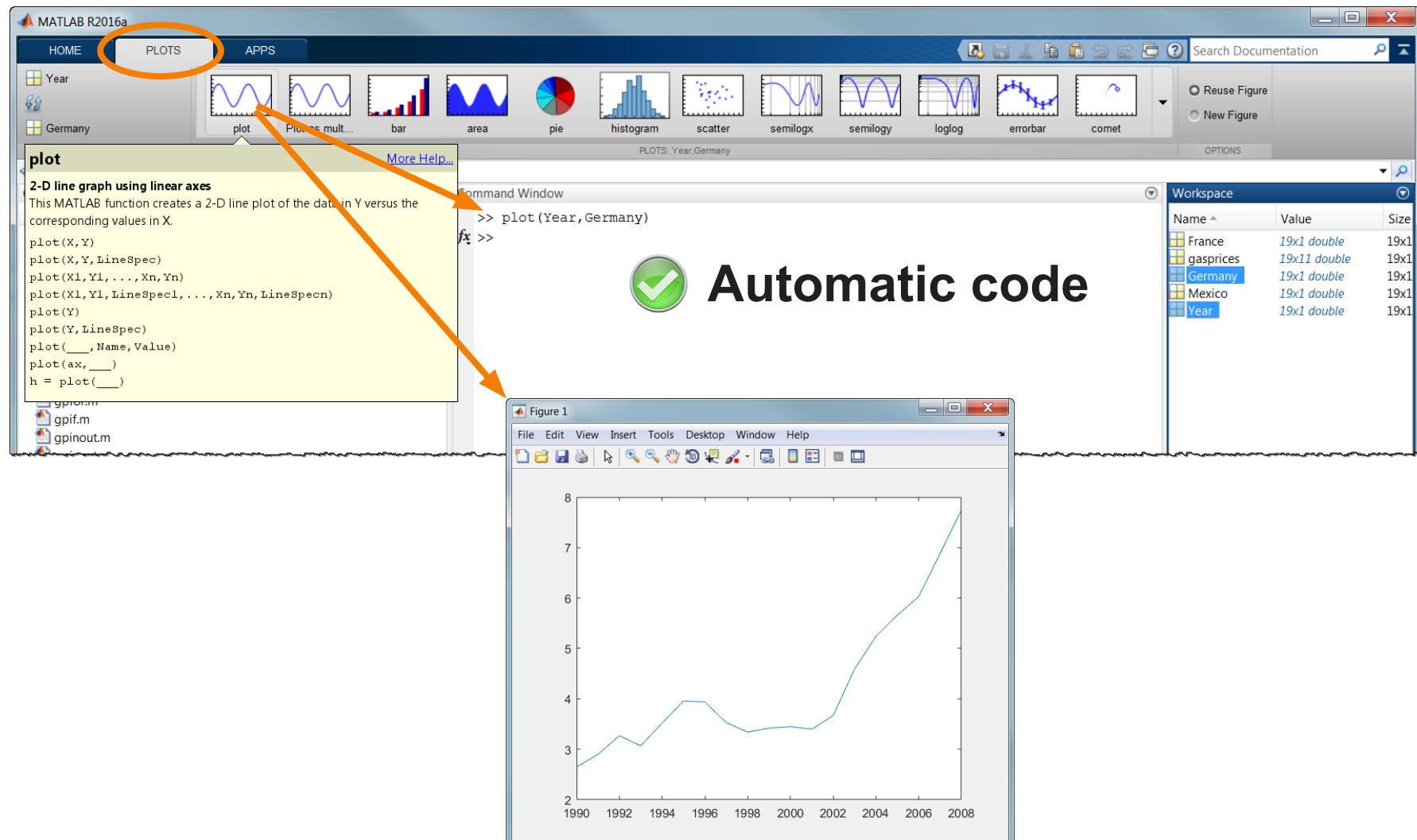
- Open Selection
- Save As...
- Copy
- Duplicate
- Delete
- Rename
- Edit Value
- plot(gasprices1)
- bar(gasprices1)
- area(gasprices1)
- pie(gasprices1)
- histogram(gasprices1)
- Plot Catalog...

Workspace (Bottom Right Window): This window shows the workspace after the new variable 'Year' has been created. The variable 'gasprices' is highlighted by a yellow arrow.

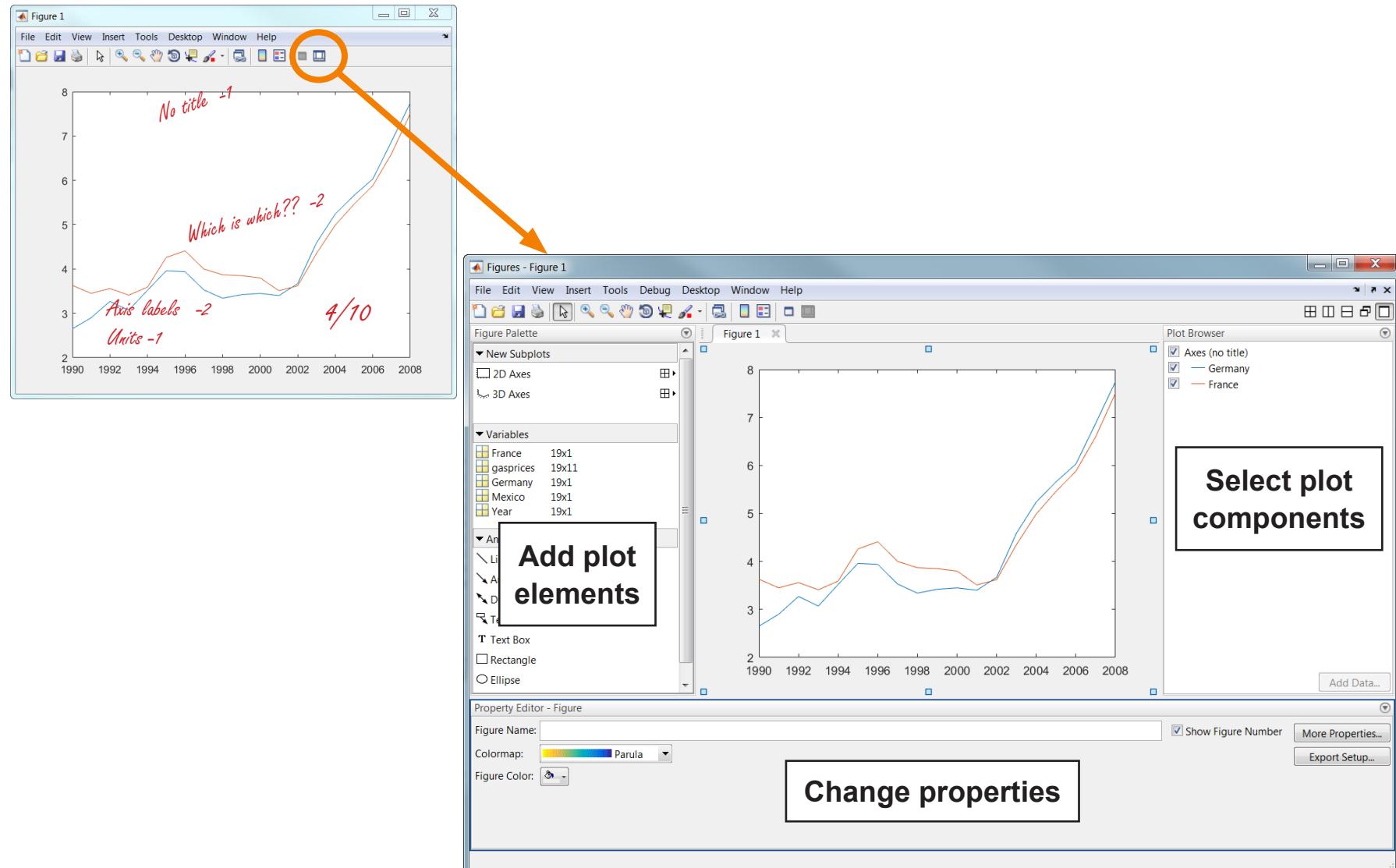
Saving and Loading Variables



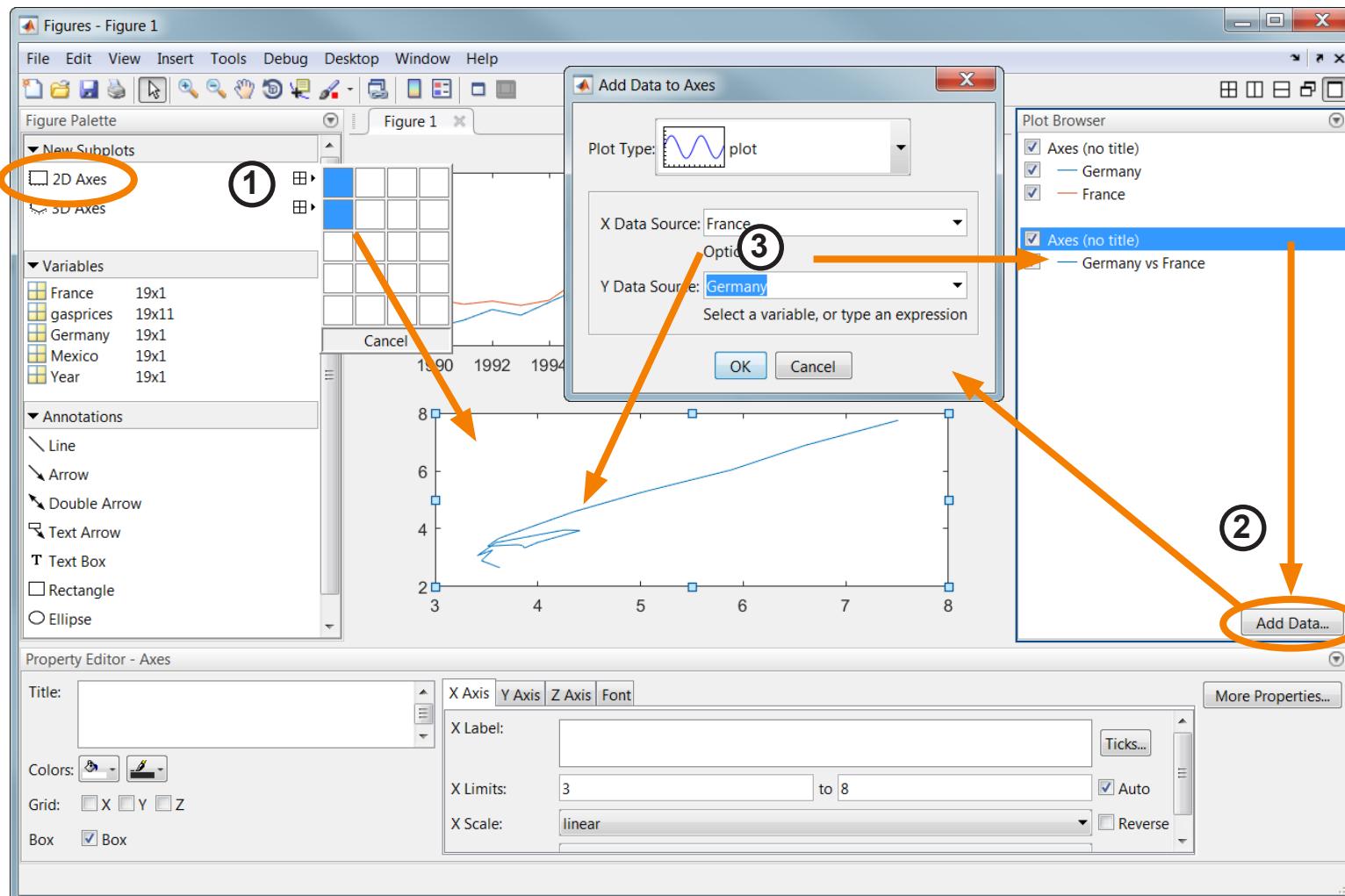
Plotting the Data



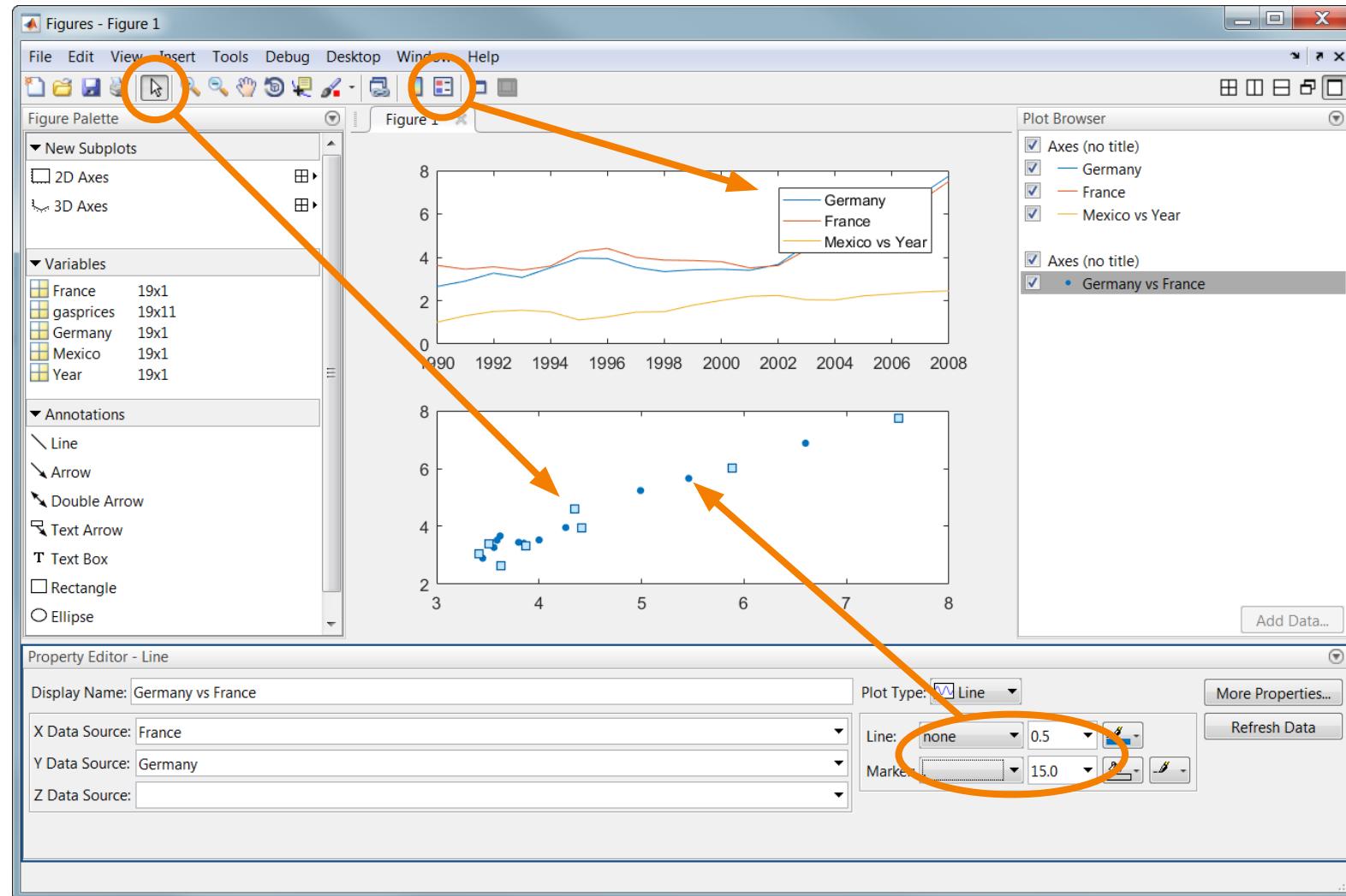
Plot Tools



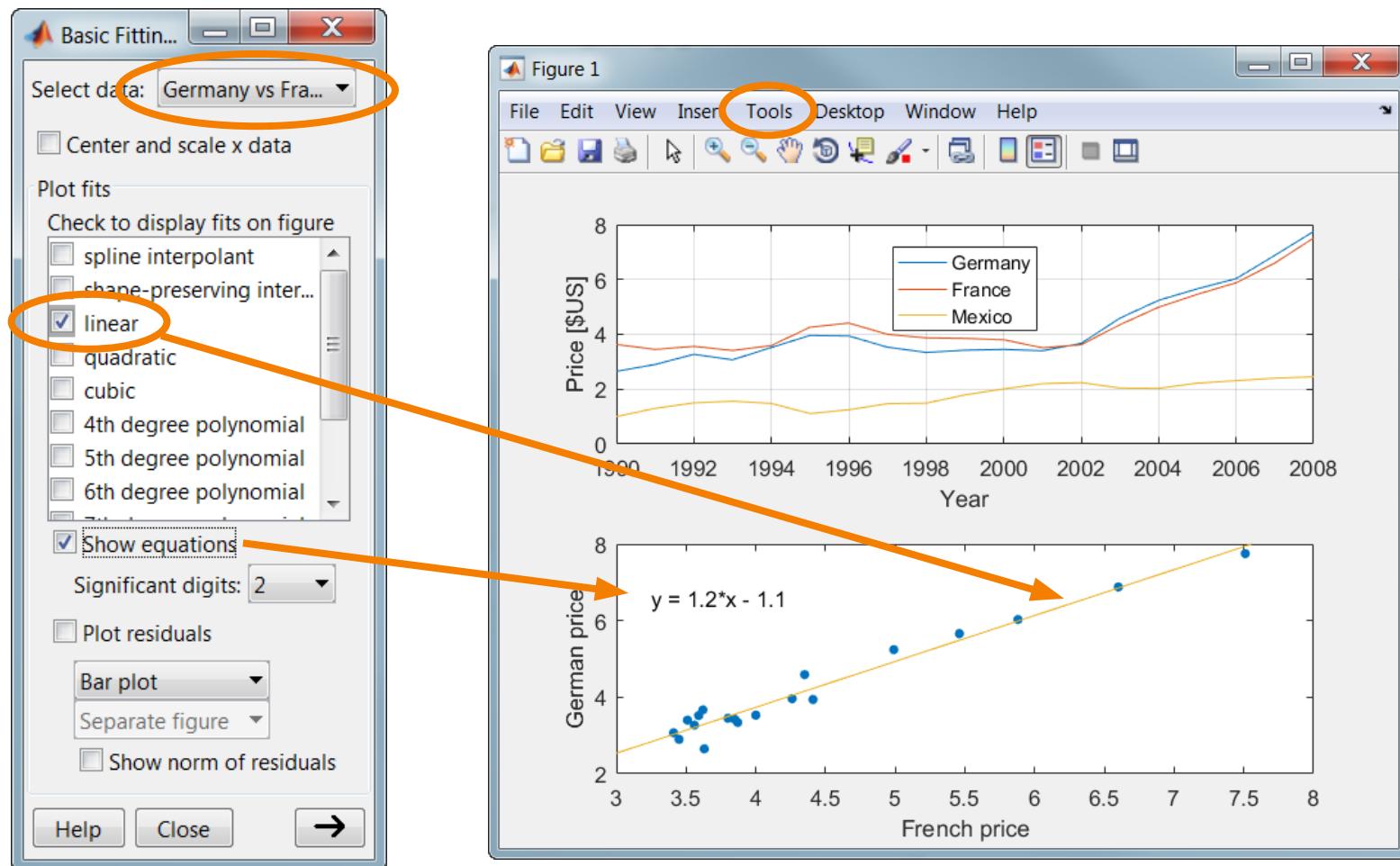
Multiple Plots



Formatting the Plot



Basic Fitting



Exporting to Another Application

The screenshot shows the MATLAB desktop environment. A figure window titled "Figure 1" is open, displaying a line graph of gasoline prices over time for Germany, France, and Mexico. The "File" menu is open, and the "Copy Figure" option is highlighted with a red oval. The main menu bar also has a red oval around the "File" and "Edit" items.

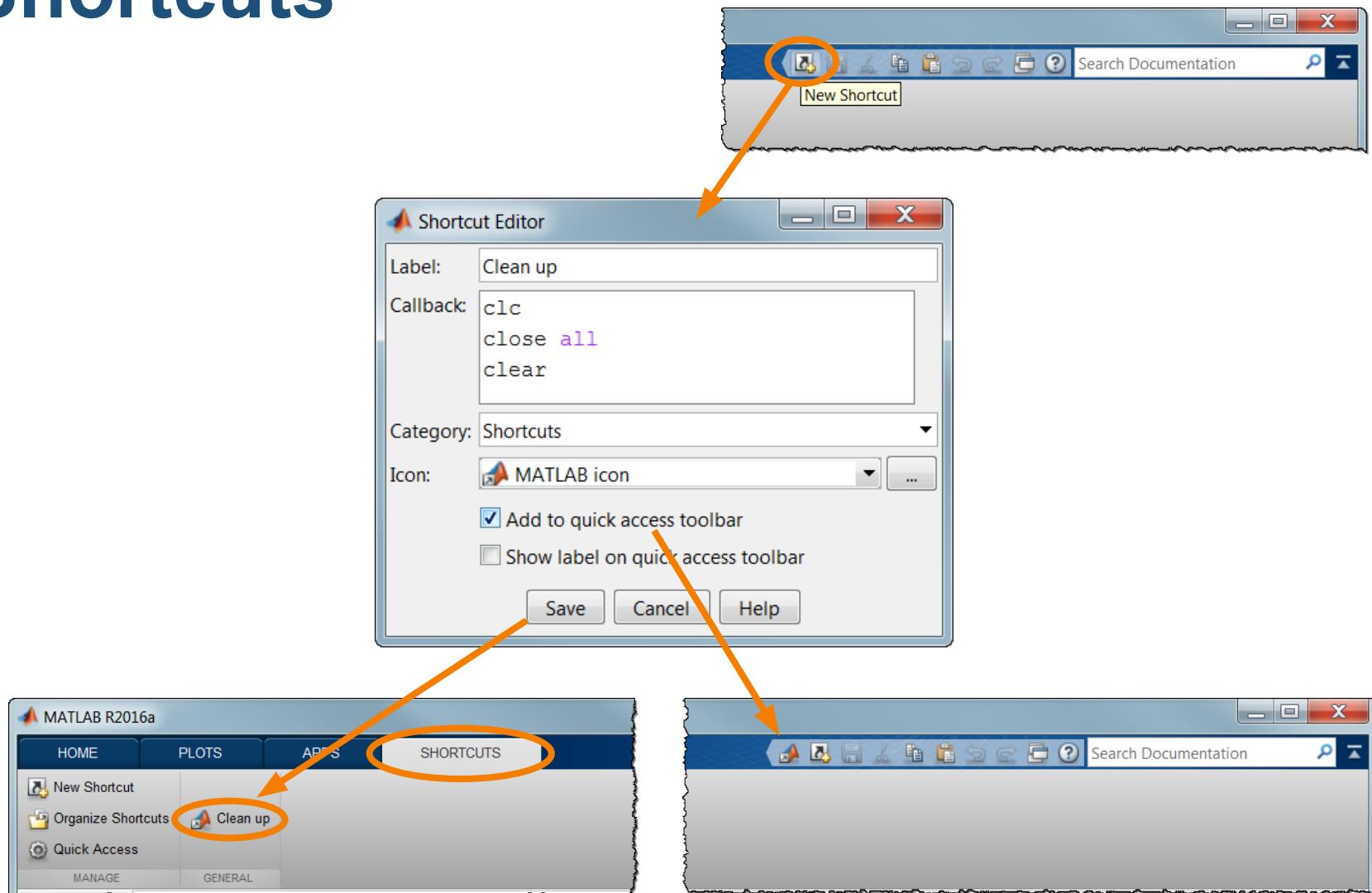
Figure 1 Content:

- Line graph showing Price [US\$] vs Year (1990-2008) for Germany (blue), France (red), and Mexico (yellow).
- Scatter plot showing French price vs German price.

PowerPoint Slide Content:

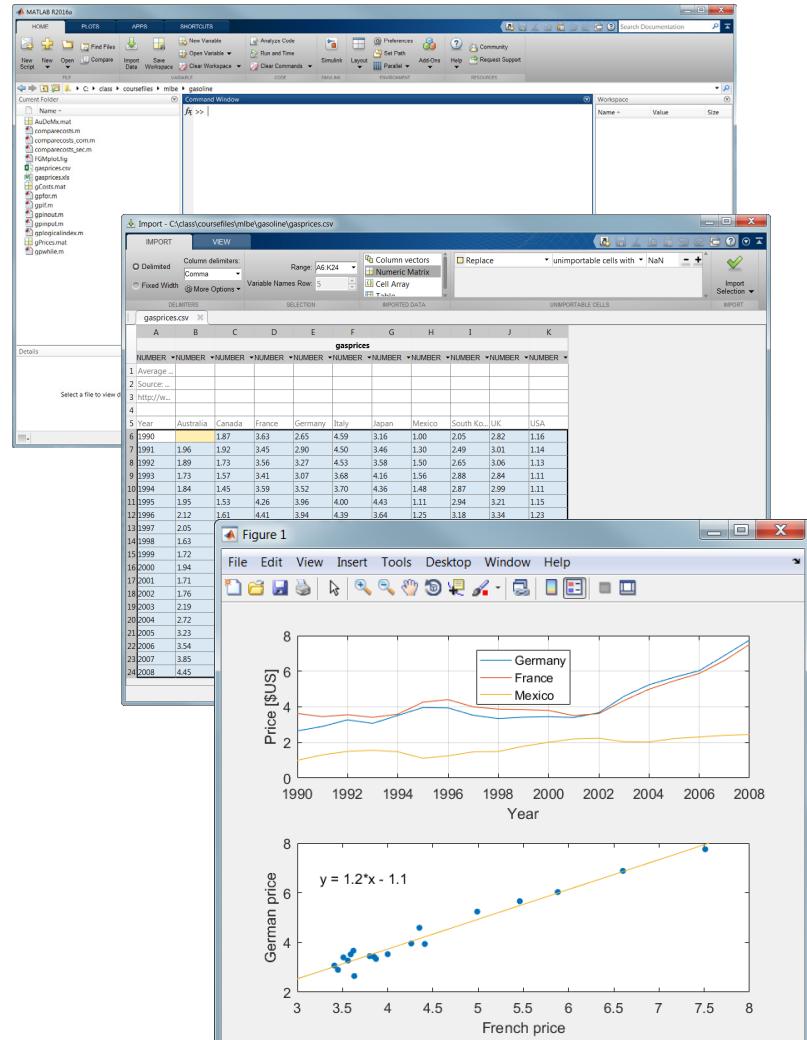
- Title: International Trends – Gasoline
- Line graph showing Price [US\$] vs Year (1990-2008) for Germany, France, and Mexico.
- Scatter plot showing French price vs German price with a linear regression line: $y = 1.2x + 1.1$.
- Flags of France, Germany, and Mexico.
- Text: Correlation within EU (with a pointer to the France flag).

Shortcuts



Summary

- Navigating the interface
- Reading data from file
- Saving and loading variables
- Creating custom plots
- Exporting graphics for use in other applications



Test Your Knowledge

1. Where does MATLAB display a listing of the variables currently in memory and their associated attributes?
 - A. Command Window
 - B. Workspace browser
 - C. Current Directory browser
 - D. Command History
2. The default MATLAB variable type for numeric data is:
 - A. **Single**
 - B. **Double**
 - C. **Cell**
3. T/F: The MATLAB desktop is customizable.