MATLAB
Dates and Data

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AGENDA

- **Importing Data**
- **Dates and Time**
- **Plots and Graphs**
- **Econometrics Toolbox**

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DATA IMPORT

- Can import `xls`, `csv`, `txt`
- Use Data Import Wizard (Menu `File -> Import Data`)
- Or general purpose function: `importdata`
- Other high level functions `xlsread`, `xlswrite`, `dlmread`, `dlmwrite`
- Lower level: `fopen` and parse with `textscan` (very powerful, see my freadread package at `http://www.elmarmertens.ch`)
- Matlab's own format: `load save` (can also handle ASCII, see `doc save`)

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Date Numbers

$$\underbrace{YYYYYY}_{\text{day count}}.\underbrace{TTTTTT}_{\text{time}}$$

- MATLAB day 1 is 1 Jan 0 AD
- Excel day 1 is 31 Dec 1899 (most versions)
- `m2xdate`, `x2mdate`

Useful commands

- `datenum`, `datestr`, `datevec`
- For labeling plots: `datetick`

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- System time: `clock`, `now`, e.g. to display current time `datestr(now)`
- Set stopwatch timer: `tic`
- Get stopwatch time: `toc`
  (See also `profile` for in-depth performance analysis)

FIND

find

“Find indices of nonzero elements”

```
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```

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Application: Last 5 Trading Days in Dec 2007

```
[Y M D]=datevec(tradingdays);
last5  =find(Y == 2007 & M == 12, 5, 'last')
```

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Commands

`plot(y)`	Plot of data vector or matrix y Note: Matrices plot along rows
`plot(x,y)`	Plot x against y
`plot(x,y, '.')`	Scatter plot
`plot(x,y, 'b-')`	Plot with blue line
`hist(y)`	Histogram
`hist(y,n)`	...using n bins
`surf(X,Y,Z)`	3D surface
`mesh(X,Y,Z)`	3D mesh
`plot3(X,Y,Z)`	points/line in 3D

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...or use plot tools in Workspace browser

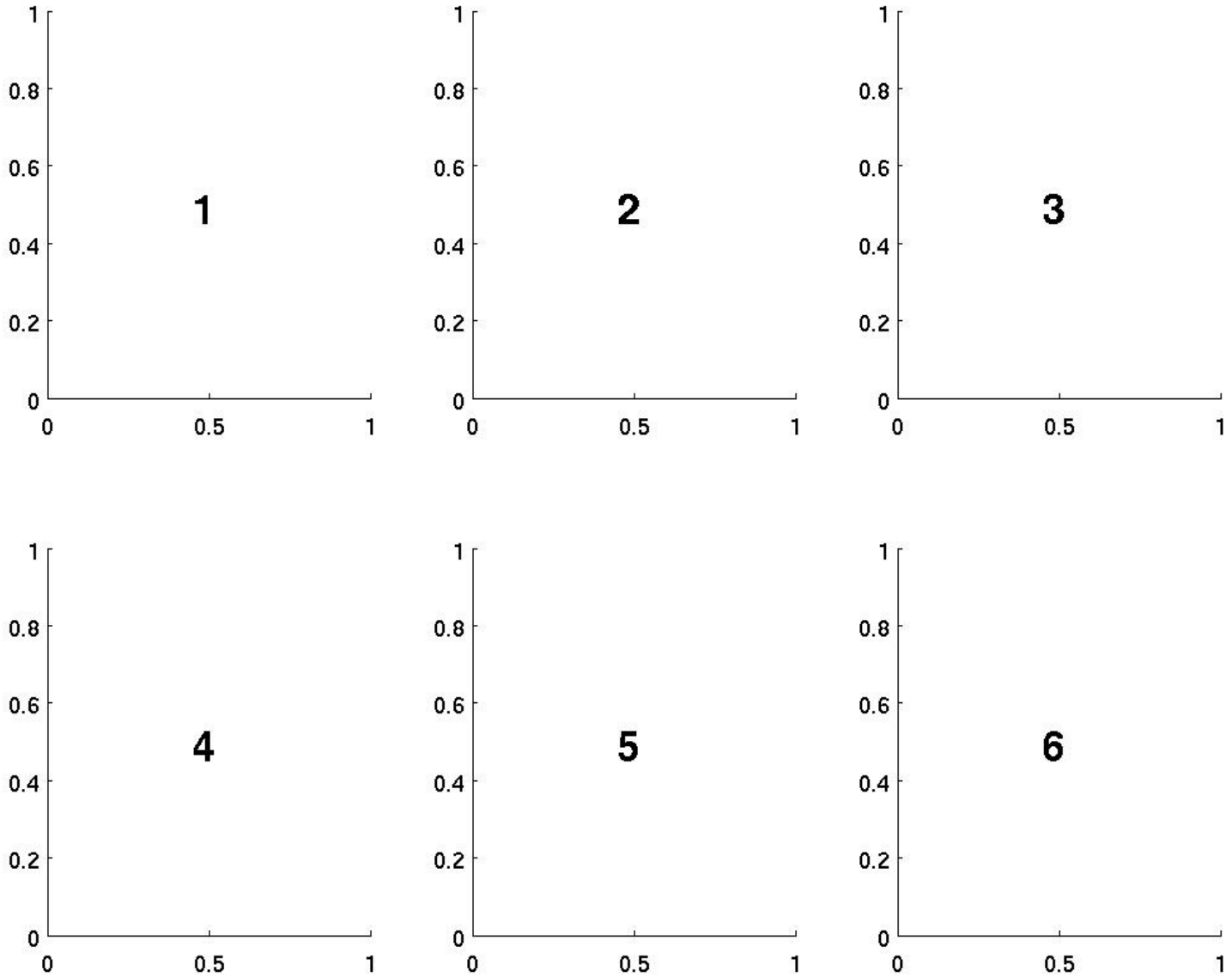
Useful commands

`figure`	Open empty figure
`close`	Close current figure
`close all`	Close all figures
`subplot(r,c,n)`	Setup nth plot on $r \times c$ grid

SUBPLOT EXAMPLE

`subplot(2,3,n)`

SUBPLOTEXAMPLES.M



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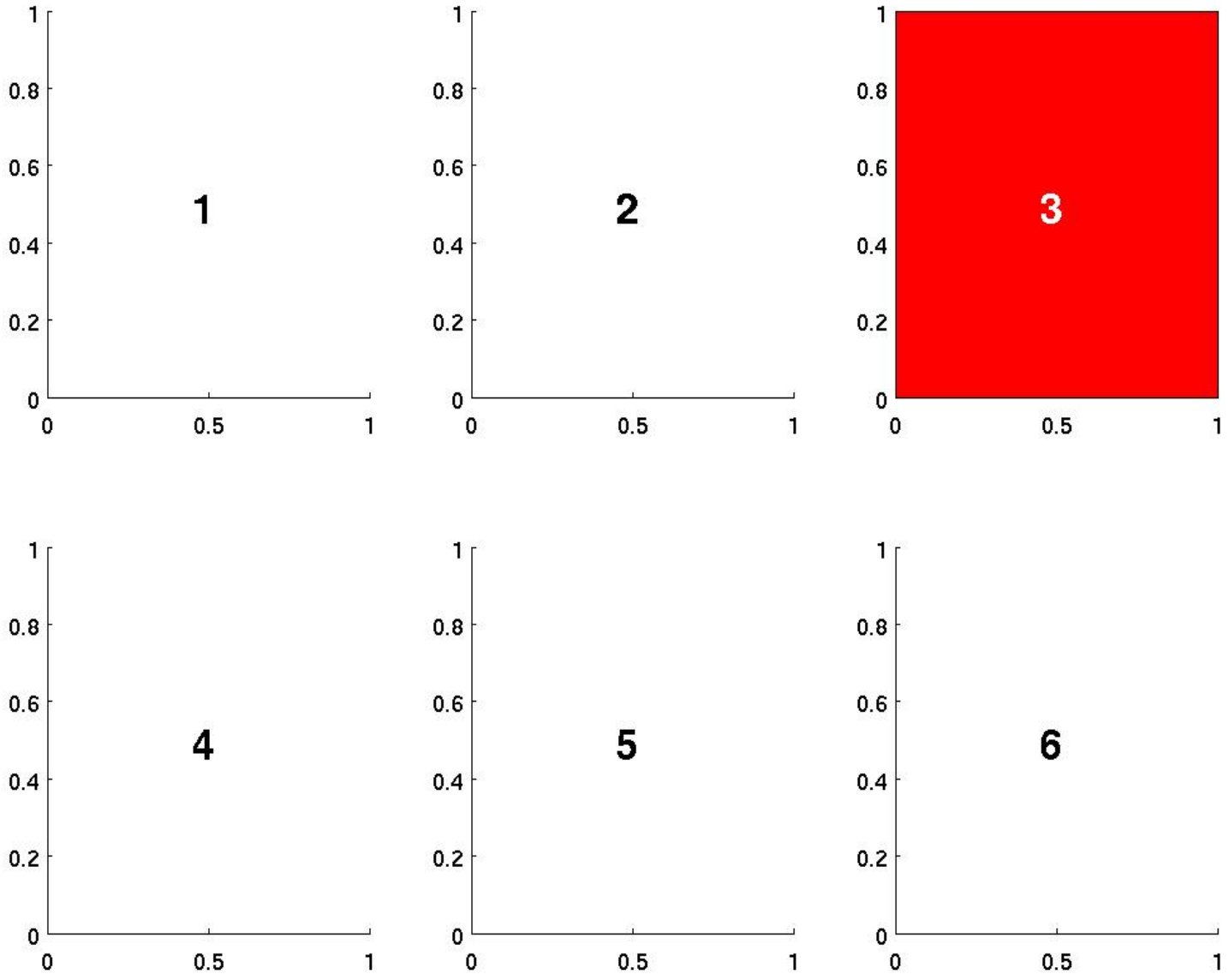

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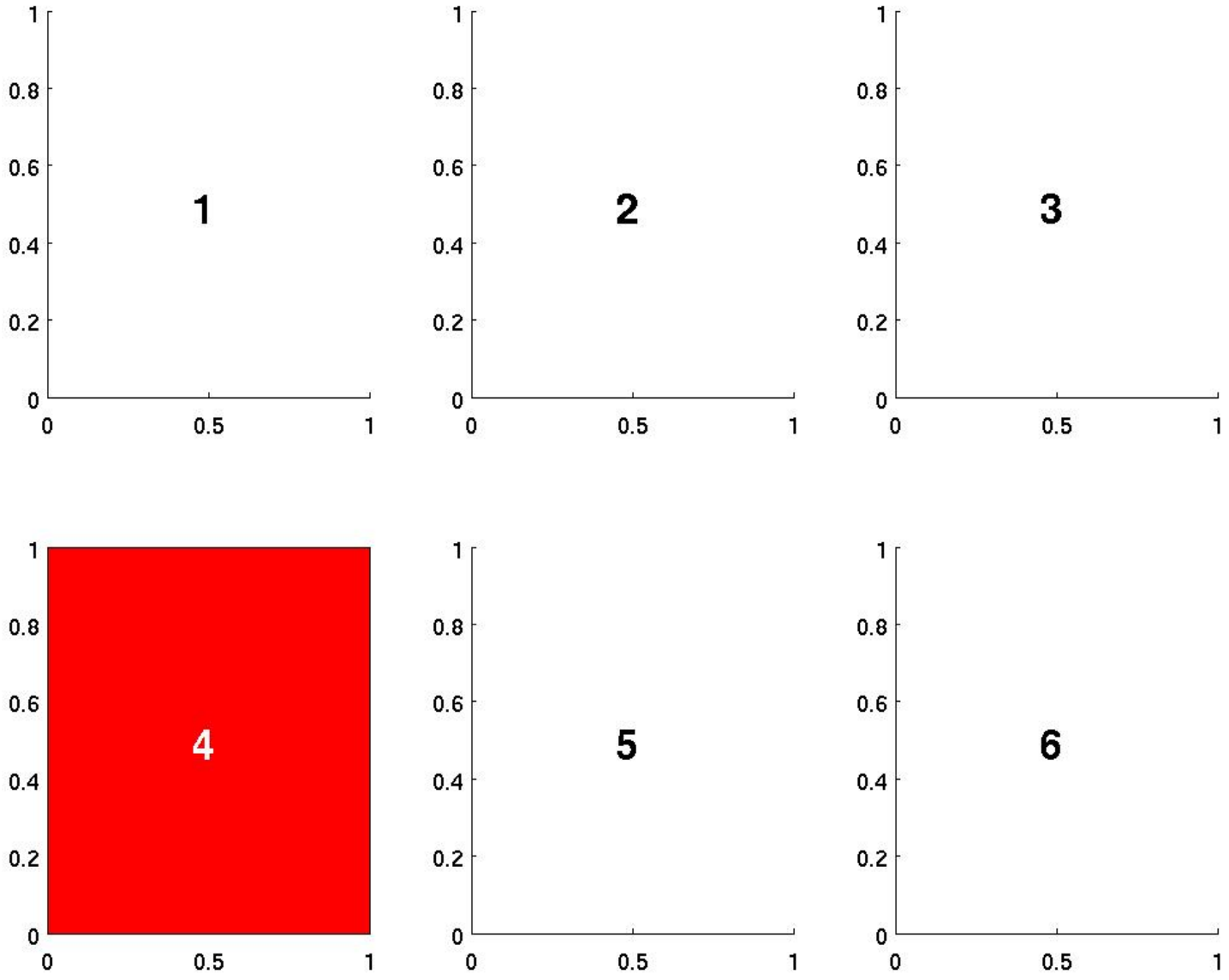

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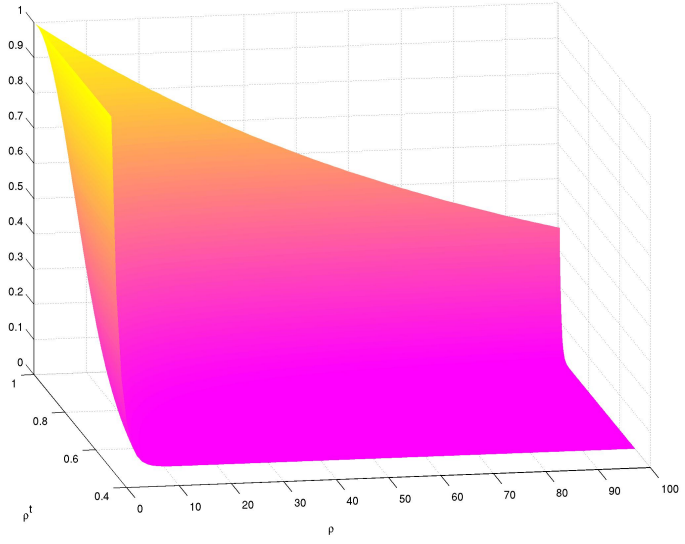
`subplot(2,3,4)`	Bottom left plot

See also: `ylabel`, `xlabel`, `title`, `ylim`, `xlim`, `clf`, `cla`

3D PLOTS

e.g.: impulse responses of AR(1) with varying persistence



surfacedemo.m:

```
[LAGS, RHOS] = meshgrid(0:100, .5:.01: .99);
surf(LAGS, RHOS, RHOS.^LAGS)
shading interp
colormap spring
```

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JPL TOOLBOX

Freeware

- Compiled by James P. LeSage
- `http://www.spatial-econometrics.com`

Features

- Common format for results
- Pretty print and plot routines: `prt` and `plt`
- Good regression library
- Alternatives to MATLAB toolboxes: optimization, date functions, distribution library (I recommend MATLAB)
- More: Gibbs sampling, VAR's etc
- Extensive PDF documentation

JPL REGRESSION LIBRARY

```
>> help ols
  PURPOSE: least-squares regression
 ---------------------------------------
  USAGE: results = ols(y,x)
  where: y = dependent variable vector
         x = independent variables matrix
 ---------------------------------------
  RETURNS: a structure
         results.meth  = 'ols'
         results.beta  = bhat       (nvar x 1)
         results.tstat = t-stats    (nvar x 1)
...
```

OLS EXAMPLE

Univariate: $y_t = \alpha + \beta x_t + \varepsilon_t$

```
const = ones(size(x,1). 1);
reg   = ols(y, [const x]);
prt(reg);
```

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Univariate: $y_t = \alpha + \beta x_t + \varepsilon_t$

```
const = ones(size(x,1). 1);
reg   = ols(y, [const x]);
prt(reg);
```

Multvariate: $y_t = \alpha + \beta_1 x_t + \beta_2 z_t + \varepsilon_t$

```
const = ones(size(x,1). 1);
reg   = ols(y, [const x z]);
reg.beta(1) % alpha
reg.beta(2) % beta_1
reg.beta(3) % beta_2
```

Using Gali's calibration

1. Simulate $T = 100$ observations for Δa_t and g_t
2. Compute observations for x_t, π_t and i_t
3. Estimate
$$i_t = \phi + \phi_\pi \pi_t + \phi_x x_t + \varepsilon_t$$
4. (Discuss your results in light of Cochrane (2007, NBER))
5. What would happen if you were to repeat the regressions above ...
   - ... whilst setting $g_t = 0$ for all observations?
   - ... with $T = 10,000$ observations?

AR(1) process

$$y_t = \rho y_{t-1} + \sigma \varepsilon_t \quad \varepsilon_t \sim N(0,1)$$

Continuing our earlier exercise . . .

1. Simulate $M = 1000$ times and store OLS estimates of ρ
2. Plot histogram of $\hat{\rho}$: `hist(rhohats, 50)`
3. Change ρ and T

HURWICZ BIAS IN AR(1) PERSISTENCE

HURWICZ2.M

$\rho = 0.99$ and $T = 100$