

Advanced Research Tools for Economics and Business Administration (Part II)

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Previous tutorial

Still somewhat more theoretical (why do you want to learn new tools)

- Importance of writing things down (reproducibility)
- Text files are the bomb:
 - scriptable (customizable)
 - input and output in/for other applications
- pros and cons of \LaTeX
- Why bother with learning \LaTeX ?
 - for dead threes (aka paper)
 - html (cloud) uses \LaTeX syntax as well for formula's and graph annotation

A quick recap

- Specific \LaTeX commands starts with an \backslash
 - \LaTeX
- Inline equations are within $\$ \$$
 - $\text{\$}\text{\frac{a}{b}}\text{\$}$ is the fraction between $\text{\$a\$}$ and $\text{\$b\$}$
- There are a number of symbols that you cannot immediately use:
 - \backslash , $\$$, $\&$, $\%$, $\{$ and $\}$ are the most important (solution: start with an \backslash)
- Environments start and end

```
\begin{equation}
a^2 + b^2 = c^2
\end{equation}
```

General structure

```
\documentclass[twocolumn, a4paper]{article}

% Preamble: how should it look like
\usepackage{multicol, lipsum}
\usepackage[english, german]{babel}

\begin{document}
    % Body: the real contents
    \lipsum
\end{document}
```

This tutorial

More practical, play around with \LaTeX . In specific:

- packages, classes, etc. (make things look better)
- figures (usually import them, but sometimes make them yourself)
- tables
- automating tables with statistical output
- slides (just copy & paste from `.tex` document)

More information

- Look at these slides (.tex file provided)
- Look at the background material (Shiny paper both in .pdf and .tex file)
- Use templates: <http://www.latextemplates.com/>
- Problems? Google it:
<http://tex.stackexchange.com/questions>

The use of packages

- Typically, packages are used to change appearance
- To ensure no errors, usually opt for the full installation or have access to internet
- There are lots of them, see CTAN
- Often used packages
 - amsmath, graphicx, subfig, marvosym, microtype, booktabs, lipsum, pdfscape, fullpage
- format:

```
\usepackage[colorlinks=true,citecolor=magenta,  
            urlcolor=magenta]{hyperref}
```

The use of classes

- Typically one uses the article class
- However, there is as well a book, mininal, report, beamer class etcetera
- Specific user written classes are memoir and elsarticle classes
- Classes come with options such as

```
\documentclass[12pt, a4paper]{article}
```


Bibliography

Default format is BibTeX - customizable (however limited) - defaults is good

If you want to customize quite a lot: biblatex-biber combination
- usage

```
\usepackage[backend=biber]{biblatex}
```

or go nuts

```
\usepackage[style= authoryear-icomp,  
             backend=bibtex,  
             natbib=true,  
             firstinits=true,  
             uniquename=true,  
             backref=false,  
             doi=false,  
             isbn=false,  
             url=false,  
             maxnames=2,  
             maxbibnames=10,  
             dashed =true,  
             backend=biber]  
{biblatex}
```

Import them

Figures/graphs and tables in a floating environment

```
\begin{figure}[h!]  
  \center  
    \includegraphics{ligatures_latex}  
  \caption{...}  
  \label{ligatures}  
\end{figure}
```

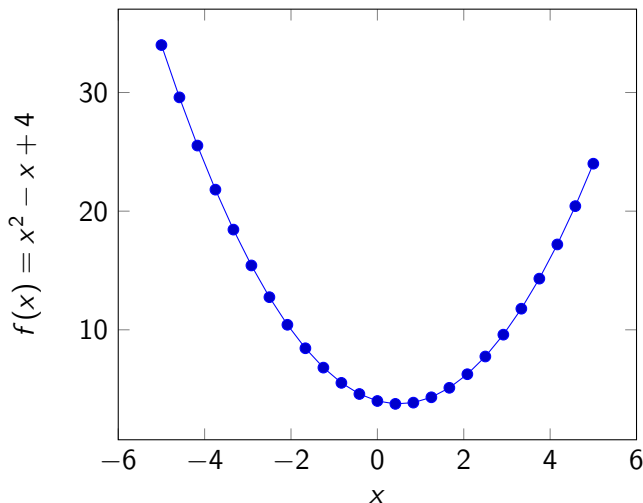
- `\ref{ligatures}` gives you now the correct internal reference
- How to make pictures then:
 - In the statistical environment you are working in
 - plotly

Making them yourself in \LaTeX (advanced)

PGF/TikZ combination for producing vector graphics

```
\usepackage{tikz, pgfplots}
\begin{tikzpicture}
  \begin{axis}[
    xlabel=$x$,
    ylabel={$f(x) = x^2 - x + 4$}
  ]
    % use TeX as calculator:
    \addplot {x^2 - x + 4};
  \end{axis}
\end{tikzpicture}
```

Which results in



Some guidelines

- No vertical lines!
- small spaces are usually better than horizontal lines
- Booktabs is a nice package

```
\toprule  
\midrule  
\addlinespace  
\bottomrule
```

- Only include stuff that is important

Standard tables

```
\begin{table}[h!]
  \caption{Brilliant table}
  \label{tab:briltable}
  \begin{tabular}{cc}
    Row 1 & 100 \\
    Row 2 & 200
  \end{tabular}
\end{table}[h!]
```

Table 1:Brilliant table

Row 1	100
Row 2	200

Table and stuff

This does not look nice!

```

\begin{table}[htbp]\centering
\def\sym#1{\ifmmode^{#1}\else\(^{#1}\)\fi}
\caption{Dep = Milles per Gallon}
\begin{tabular}{l*{2}{D{.}{.}{-1}}}\
\toprule
& \multicolumn{1}{c}{(1)} & \multicolumn{1}{c}{(2)} \\
& \multicolumn{1}{c}{Mileage (mpg)} & \multicolumn{1}{c}{Mileage (mpg)} \\
\midrule
Car type & -1.6500 & -2.2035* \\
& (1.0760) & (1.0592) \\
Weight (lbs.) & -0.0066** & -0.0166** \\
& (0.0006) & (0.0040) \\
weight\_sqr & & 0.0000* \\
& & (0.0000) \\
Constant & 41.6797** & 56.5388** \\
& (2.1655) & (6.1974) \\
\midrule
Observations & 74 & 74 \\
\textbackslash(R^{2}\textbackslash) & 0.663 & 0.691 \\
F & 69.7485 & 52.2515 \\
\bottomrule
\multicolumn{3}{l}{\footnotesize Standard errors in parentheses} \\
\multicolumn{3}{l}{\footnotesize + \textbackslash(p<0.1\textbackslash), * \textbackslash(p<0.05\textbackslash), ** \textbackslash(p<0.01\textbackslash)} \\
\end{tabular}
\end{table}

```


So import stuff (stata do-file example) !

```

sysuse auto                                # load car data set
regress mpg foreign weight                 # first regression
eststo linear                              # store first regression
gen weight_sqr = weight*weight             # Quadratic term
regress mpg foreign weight weight_sqr      # 2nd regression
eststo quadratic                          # store second regression
esttab linear quadratic ///                # write to output file
    using "${outputfiles}Results.tex", ///
    star(+ 0.1 * 0.05 ** 0.01) replace b(%9.4f) ///
    se r2 scalars("F") label keep ($covariates) ///
    title("Dep = Miles per Gallon") ///
    booktabs alignment(D{.}{.}{-1}) nogaps

```

With output

Table 2: Dep = Miles per Gallon

	(1) Mileage (mpg)	(2) Mileage (mpg)
Car type	-1.6500 (1.0760)	-2.2035* (1.0592)
Weight (lbs.)	-0.0066 * * (0.0006)	-0.0166 * * (0.0040)
weight_sqr		0.0000* (0.0000)
Constant	41.6797 * * (2.1655)	56.5388 * * (6.1974)
Observations	74	74
R^2	0.663	0.691
F	69.7485	52.2515

Standard errors in parentheses

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$

Pros and cons

- Cons:
 - Not as quick out of the box as PowerPoint (powerphluff)
 - Typically beamer package which makes all things look alike
 - Enforces some things (e.g., limited space for tables)
- Pros:
 - Once created, similar on all versions/operating machines
 - You need to spend more time thinking
 - Better .pdf handling
 - Reuse of equations or code in general
 - There is a kind of a philosophy behind it

The Cognitive Style of PowerPoint (Edward Tufte)

Using beamer package

```

\documentclass{beamer}           % new document class
\usetheme{Darmstadt}             % new lay-out
\usecolortheme{beaver}           % new color scheme
\begin{document}                 % begin document again
    % usually frames start with begin/end , except
\frame{\titlepage}
    % Use section and subsection for slide menu
\section{Where are we}\label{where-are-we}
                                % Frame and frame title
\begin{frame}{Previous tutorial}
    Still somewhat more theoretical ...
    
$$a^2 + b^2 = c^2$$
 % formula if you want
\end{frame}
\end{document}                  % always end a document

```

In conclusion

- This tutorial is more a showcase
- Pick out the stuff you appreciate most
 - there is solution for almost everything
 - but it requires time investment
 - which only later will pay-off
- As things now develop there will be
 - more ephasis on internet/blogging publishing (slightly more advance than Facebook but on the same par as Wordpress)
 - including data and figures (dynamic infographics)
 - minor role for \LaTeX
 - For dead trees: \LaTeX is still the best when editing/writing complex documents