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

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Where are we

Previous tutorial

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

- Importance of writing things down (reproducability)
- Text files are the bomb:
  - scriptable
  - 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 \
  - `\LaTeX`
- Inline equations are within $ $
  - `$\frac{a}{b}$ is the fraction between $a$ and $b$`
- There are a number of symbols that you cannot immediately use:
  - \, $, &, %, { and } are the most important (solution: start with an \)
- 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 (make things look better)
- figures (usually import them, but sometimeS make them yourself)
- tables (import them!)
- slides (just copy & paste from `.tex` document)

Making appearances

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, pdflscape, 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}
```

Bibliopgraphy

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}
```

Better graphs

Import them

Remember figures/graphs and tables in a floating environment

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

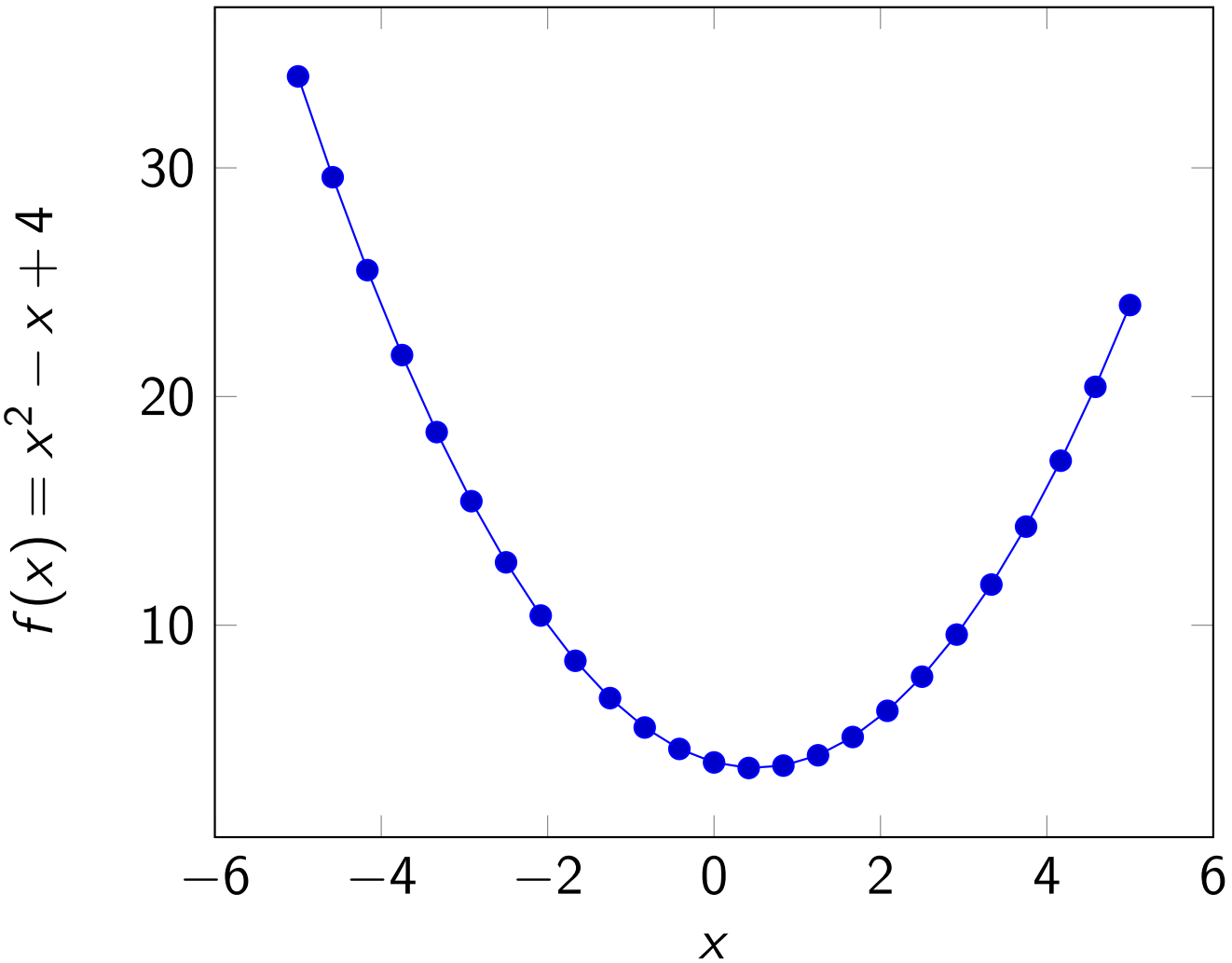
- \ref{ligatures} gives you now the correct internal reference
- How to make pictures then:
  - In the statistical environment you are working in
  - plotly

Making them yourself in LaTeX (advanced)

PGF/TikZ combination for producing vector graphics

```
\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



Better tables

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

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  \\
\(R^{2}\)           &       0.663  &       0.691  \\
F                   &     69.7485  &     52.2515  \\
\bottomrule
\multicolumn{3}{l}{\footnotesize Standard errors in parentheses}\\
\multicolumn{3}{l}{\footnotesize + \(p<0.1\), * \(p<0.05\), ** \(p<0.01\)}\\
\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 = Milles per Gallon") ///
    booktabs alignment(D{.}{.}{-1}) nogaps
```

Making slides

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