LaTeX for Economists

– Master Key Qualification Course –

Felix Albrecht

May 17 - 18, 2013

Outline

Friday

- finding sources
- managing references
- LaTeX foundations
- Beautifying (1)

Saturday

- Beautifying (2)
- References
- Vectorgraphics
- Presentations

Introduced Software

LaTeX – MikTeX (Win) | TeXShop (Mac) | TeXLive (Linux)

Editor – TeXmaker

Ref-Mgr. – Mendeley

Vectorgr. – Inkscape + pstoedit + ghostscript

Firefox' Keyword Search

1. Open *Google Scholar*
2. Right click **in the** search field
3. Click '*Add a Keyword for the Search...*'
4. In the field '*Keyword:*' add '**gs**'
5. Press '*Save*'

Enter '`gs Search term`' in your address bar.

Very useful for the Elektronischer Zeitschriftenkatalog

Google Alert

- notifies you if it finds *new* search results, given your search parameters
- mostly useful for longer term projects

1. search for something on *gs*

Mendeley Desktop

- '*iTunes*' for paper (renames, sorts, stores)
- imports references from websites, PDF meta info, PDF content, DOI, PubMed, ...
- online account, including larger researcher community + 1GB free online paper storage
- group share functions
- synchronisation over several PCs
- available for all platforms
- **FREE!** + payable extensions (larger storage, more people per group, Mendeley recommendation)

DOI – *Digital Object Identifier*

- database that contains references for many current papers (by *CrossRef*)
- currently *de facto* standard
- search for it in the PDF or on the websites
- reduces brain cancer
- if Mendeley finds it, it'll use it to import the correct citation
- sometimes even papers' reference list

LaTeX Installation

Windows users:

- Fetch and install the `Basic Miktex Installer` from http://miktrex.org.
  - Set "Automatically install missing packages?" to Yes

Mac users:

- Fetch and install `TeXShop` from http://pages.uoregon.edu/koch/texshop/

Linux users:

- texlive-latex-recommended (Ubuntu Software Center)

Editor Installation

we use TeXMaker

Windows / Mac:

- http://www.xm1math.net/texmaker/

Linux users:

- texmaker (Ubuntu Software Center)

TeX-File / Compiler / Editor

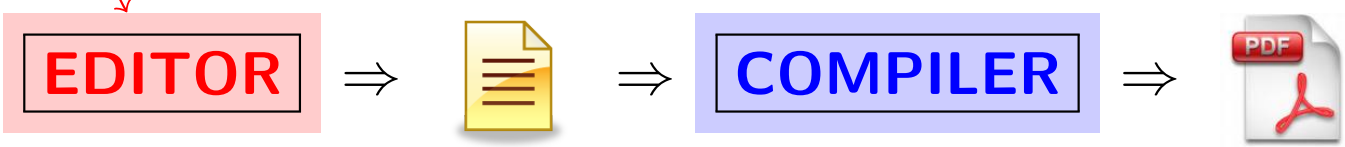
TeX-File Text file that contains the LaTeX source code and has the extension "'.tex"'.

Compiler *Compiles* (turns) the source code TeX-File into a pretty PDF or DVI. (Some special extensions permit conversion to HTML, RTF, ODT.)

Editor Text-file editor like famous notepad. Special LaTeX-editors provide text coloring, macros for quicker writing and compiling shortcuts.

How it works.

- LaTeX / text file editor – offers text highlighting, and shortcuts to LaTeX functions and symbols
- LaTeX source file – a text file that contains the document source code (texts, commands, etc.)
- *compiles* (turns) the source code into PDF or several other formats
- final output – additional file created containing the layouted document (usually PDF)



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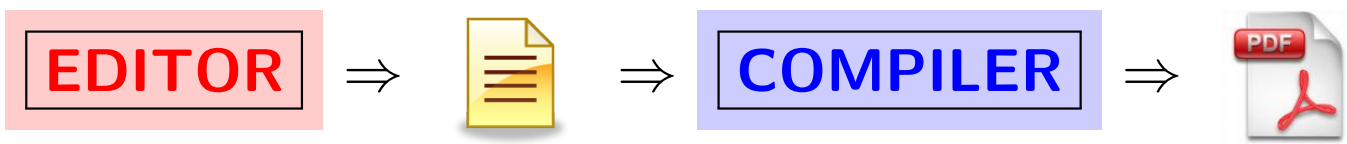

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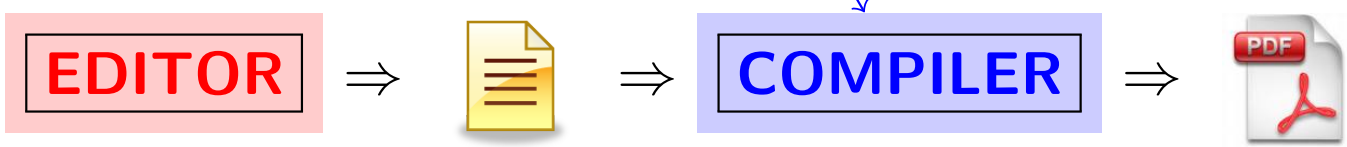

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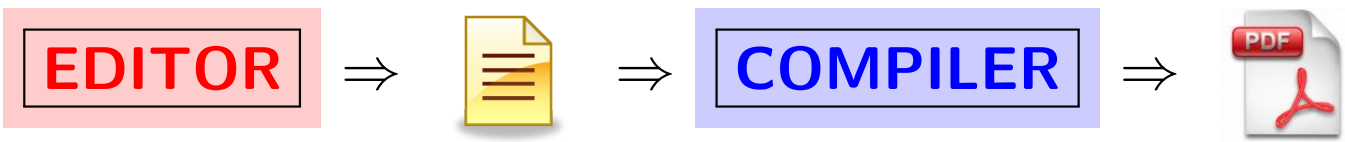

Head

Definitions,

packages, settings.

```
\documentclass[a4paper,12pt]{article}
\usepackage[utf8]{inputenc}
\title{Blabla}
\author{Muppet}
\newcommand{\tbs}{...}
```

Body

Structure, text,

layout, bibliography,

appendix, etc..

```
\begin {document}
\maketitle
\tableofcontents
\section{Intro..}
...
\thebibliography{...}
\end {document}
```

Documentclass

. . . defines *what kind* of document is produced. Standard classes are:

article – most used, for papers, homeworks, etc..

report – offers support for `chapters` and several columns on one sheet.

book – supports `chapters` changes pagenumbering and header ahdnling.

letter – provides basic letter layouting US-style

Documentclass

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

. . . takes arguments of the font size `12pt`, the paper size `a4paper` and the language `ngerman` ('new german'). The language option is important to tell LaTeX word breaking rules and the use of the correct dictionary. The language can alternatively be called via usage of the  `babel`.

Packages

. . . are little "‘Add-Ons"’ to the main program which provide additional features like fancy headers, coloring text, working with graphics and a lot more.

```
\usepackage[latin1]{inputenc}
```

Command

- is a simple LaTeX function.
- starts with a \
- if it works with values it is followed or enclosed by {}

`\LaTeX` – LaTeX

`\textbf{bold font}` – **bold font**

`{\LARGE large text}` – large text

Environments

. . . are LaTeX commands of the following form:

```
\begin{environment}
    content
\end{environment}
```

center, table, enumerate, itemize

Within the environment a, from the *normal* text, different behavior is enforced.

Note

The largest environment of a TeX-File is the document body itself.

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud ...

Code:

```
Lorem ipsum dolor sit amet, consectetur adipisicing
elit, sed do eiusmod tempor incididunt ut labore et
dolore magna aliqua. Ut enim ad minim veniam, quis
nostrud \ldots
```

Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud ...

Code:

```
\begin{flushright}
Lorem ipsum dolor sit amet, consectetur adipisicing
elit, sed do eiusmod tempor incididunt ut labore et
dolore magna aliqua. Ut enim ad minim veniam, quis
nostrud \ldots
\end{flushright}
```

Basic ideas

Enclose

In LaTeX areas with specific properties are always enclosed by either an environment or the {} of a command.

The text body e.g. is enclosed by the document environment, large text by brackets,etc.

```
\begin{itemize}
\item element one
\item element two
\end{itemize}
```

- element one
- element two

Basic ideas

From the outside in

It is possible to nest commands in LaTeX.

Nested commands are always evaluated from the outside in.

```
\textbf{just bold ...{\Large bold and large}}
```

just bold ...bold and large

Basic ideas

Linear evaluation

The compiler works through the TeX-file linearly from top to bottom.

This causes a table of contents to be generated or changed only after the `second run`. The same is true for lists of figures, glossaries, etc..

Troubleshooting (1)

Brackets

Opened brackets {

have to be closed again.

}

Even though it sounds trivial, this is by far the most frequent mistake.

```
Hint:  Close the brackets first and jump back to
write its content.  / Use auto-completion.
```

Getting to know your editor

- coding window (center)
- preview window (right or separate)
- command sidebar (left)
- log + compiler output window (bottom-center)
- document wizard
- personal shortcuts
- quick compile button

Let's start! – *(Hint use the wizard.)*

Document type – article

Font size – 11pt

Use package – inputenc, option = utf8

Insert – author

Insert – title

Insert – \maketitle

Insert – 2 x \section{...}

Insert Env. – appendix

Fetch some text and fill it into the document. (lipsum.com)

Formulae

`$ x^{\alpha} $` → x^{α}

`$ x_{\alpha} $` → x_{α}

`$ \frac{x}{y} $` → $\frac{x}{y}$

Environments

- `$...$` – in-text math formula.
- `$$...$$` – formula in own line without counter.
- `equation,eqnarray,align` – genuine environments with counters.
- `equation*,eqnarray*,align*` – genuine environments without counters.

Formulae

Greek symbols

Logic: – capitalized first letter = big greek letter

– small first letter = small greek letter

`\Omega` – Ω

`\omega` – ω

Hint: Use the editors buttons. (You don't have to remember everything.)

Formulae

Write the below formulae using the `align` environment.

The editor is your friend!

$$E\left(\sum_{j=i}^{G} a_j(\mathbf{x})y_j + b(\mathbf{x})|\mathbf{x}\right) = \sum_{j=1}^{G} a_j(\mathbf{x})E(y_j|\mathbf{x}) + b(\mathbf{x}) \tag{1}$$

$$\Omega = \int f\left(\frac{\omega^2}{\beta}\right) \tag{2}$$

$$x_{1,2} = \frac{p}{2} + \sqrt{\left(\frac{p}{2}\right)^2 + q}$$

Special characters

Special charaters have to be escaped.

You have to set a \ to declare it as *non-functional*.

e.g.:

- % →\% – the %-symbol otherwise marks a comment.
- $ →\$ – the $ math $ encloses in-text math.
- & →\& – alignment character in tables and arrays.
- {} →\{ \} – command brackets.
- \→\textbackslash – a double \\ marks a linebreak.

Umlauts

. . . are not understood per default in LaTeX which is due to the fact that they are not included in ASCII. If you directly want to insert Umlauts you need to include the package `inputenc` with one of these options: `latin1, utf8, mactext, ansinew`.

```
\usepackage[ansinew]{inputenc}
```

However, this might lead to problems with the text file encoding. A way to circumvent this problem is by using `\"'`.

\"'U = Ü

\"'o = ö

Compiling Errors

Too many}'s. – You have somewhere a closing } but the opening one appears to be missing.

Undefined control sequence. – Usually a typo in one of the used commands or a command from a package which wasn't called.

Missing $ inserted! – Some math symbol used which was not enclosed in a math environment.

Compiling Errors

Runaway argument? – appears when curly brackets were not closed.

. . . ended by \end{document} – some environment was not closed.

Underfull/Overfull hbox – Trouble with the word breaking. (Can ususally be ignored.)

Word breaking

Wirtschaftskrise - Wirt\-schafts\-kri\-se

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Structure

\chapter{} – Chapter of a book.
(`Only in documentclass book.`)

\section{} – Section of an article.

\subsection{} – Subsection of an article.

\paragraph{} – Starts a new paragraph. Words in the brackets in bold font.

\footnote{} – Contains a footnote text. Directly put behind the word you want the footnote at. Numbering is done automatically. (Remember linear eval..)

\label{...} - \ref{...}

\label{...} marks an object in the texfile and uses its specific counters (e.g. figure).

A label HAS TO HAVE a unique name and is positioned after the object or within the environment.

\ref{...} uses the label name and returns the associated number.

E.g.:

We are now in subsection 1.

Hint

For elements like figures or tables, use a specific way of identifying like \label{*fig:blabla*} or \label{*tab:bla*}.

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Lists of contents

\tableofcontents – Generates the table of contents and places it *here*.

\listoffigures – Generates a list of all figures. (Requires the figure environment to be used.)

\listoftables – Generates a list of a all tables. (Requires the table environment to be used.)

Improve your document

1. Insert a table of contents.
2. Place the list of figures and tables.
3. Insert some footnotes in your document.
4. Label some sections for references in the text.

In-text commands

Empty line – New paragraph. (US style indented paragraph.)

\\ – Linebreak.

$...$ – Math in text.

\date{} – Generates a date. `\today` offers system date.

\newpage – Enforces a *new page*.

\pagenumbering{} – To switch the page numbers styles.

Options: `arabic,roman,Roman`

\maketitle – Generates a basic layout of the titlepage.

Environments

center – Centers stuff.

tabular – Creates a basic table.

quote – To emphasis a quote.

appendix – Encloses the complete appendix.

enumerate – Counting list.

align – Math environment.

titlepage – Special page enviroment for *free* styling.

Enhance your document

1. Set date to today.
2. Create an appendix. (Hint: Use Section to structure.)
3. Use small roman numbering for the pages before the intro
   arabic number for the text
   big romans for the appendix.
4. Create a quote and center a peace of your text.

Tabular – basic table

```
\begin{tabular}{l c|r}
    \hline
    \hline
    left & center & right\\
    \hline
    1 & 3 & 4\\
    6 & 7 & 8\\
\end{tabular}
```

left	center	right
1	3	4
6	7	8

Write the below table. (Manually!)

Name	USD	EUR	GBP
USD	1	0.7	0.6
EUR	1.5	1	0.8
GBP	1.5	1.1	1
JPY	0.5	0.9	0.0
CHF	1.5	0.9	0.6
CAD	1.5	0.9	0.6
AUD	1.5	0.9	0.6
NZD	0.5	0.9	0.5

Packages

geometry – Specify the side margins.

Options: `[ left= ,right= ,top= ,bottom= ]`

setspace – Command `\linespread{}`. Best result `1.39`.

graphicx – Enables graphics inclusion. Provides command `\includegraphics{}`.

inputenc – Enables system specific character use.

Recommended option: `[utf8]`

Finalize your simple paper.

1. Use the previously shown packages to enhance your document.
   - 2.5 cm borders
   - Set linespacing to “one half”.
     - Use either `\linespread{}` or other commands. (See the package documentation.)
2. Include a graphic in the graphic section.

Float environments

Where is the best spot?

Float environments look themselves for the best location of their contents based on mathematical models. They are usually used for pictures and tables.

However, you have an influence on their placement using : `[htbp]`

- `h` – "'here"'
- `t` – "'top"' of the current or an adjacent page.
- `b` – "'bottom"' of the current or an adjacent page.
- `p` – "'page"' puts it on an empty page.
- `!` – "'force it"' give a higher priority to the symbol behind it.

Float example – (table)

```
\begin{table}[!htbp]
\centering
\begin{tabular}{l *6{c}}
& col 1 & col 2& col 3& col 4& col 5& col 6\\
\hline
Line 1 & 1 & 2 & 3 & 4 & 5 & 6\\
Line 1 & 1 & 2 & 3 & 4 & 5 & 6\\
Line 1 & 1 & 2 & 3 & 4 & 5 & 6\\
Line 1 & 1 & 2 & 3 & 4 & 5 & 6\\
\end{tabular}
\caption{Caption text}
\label{tab:label}
\end{table}
```

Table example

	col 1	col 2	col 3	col 4	col 5	col 6
Line 1	1	2	3	4	5	6
Line 1	1	2	3	4	5	6
Line 1	1	2	3	4	5	6
Line 1	1	2	3	4	5	6

Table: Caption text

Floating table

Use the float environment `table` to automatically position your table at a top position in your paper!

Tabular – more column alignments

`p{width}` – Column of a fixed width. Content is lefted.

`@{...}` – Defines a column separator.

`*3{c}` – *"Repeat the following element 3 times!"* = Three centered columns.

Example – tabular more column alignments

```
\begin{table}
    \centering
    \begin{tabular}{p{7ex}|r@{$\cdot$}l| *3{c}}
        Test & 3 & 76 & 3 & 3 & 3\\
        Hallo & 4 & 89 & 4 & 6 & 8\\
        Na & 5 & 78 & 4 & 5 & 5\\
    \end{tabular}
    \caption{Caption}
    \label{tab:3}
\end{table}
```

Example – tabular more column alignments

Test	3·76	3	3	3
Hallo	4·89	4	6	8
Na	5·78	4	5	5

Table: Caption

Tabular – more commands

`\multicolumn{2}{c}{content}` – Puts content in a field that spans several columns. Also used to generate single vertical lines.

`\multirow{2}{*}{content}` – Puts content in a field that spans several rows. (Requires  `multirow`.)

`\hline` – Horizontal line that spans the whole table.

`\cline{1-5}` – Horizontal line that only spans over the given columns.

Example – tabular more commands

```
\begin{table}
    \centering
\begin{tabular}{c r|l r|p{2ex} r|}
&\multicolumn{1}{c}{}& \multicolumn{4}{c}{Player 2}\\
 & \multicolumn{1}{c}{}& \multicolumn{2}{c}{A} &  \multicolumn{2}{c}{B}\\
 \cline{3-6}
\multirow{4}{*}{Player 1}&\multirow{2}{*}{A} & 10 & & 0 & \\
&& & 10 & & 5\\
\cline{3-6}
&\multirow{2}{*}{B} & 5 & & 6& \\
&& & 0 & & 6\\
\cline{3-6}
\end{tabular}
\label{tab:pd1}
\caption{Prisoners dilemma}
\end{table}
```

Example – tabular more commands

		Player 2	
		A	B
Player 1	A	10 10	0 5
	B	5 0	6 6

Table: Prisoners dilemma

Table - multicolumn/multirow

Currencies

	Currencies		
Name	**USD**	**EUR**	**GBP**
USD	1	0.7786	0.6239
EUR	1.2842	1	0.8012
GBP	1.6029	1.2482	1
JPY	0.0124	0.0097	0.0078
CHF	1.0641	0.8286	0.6639
CAD	1.0052	0.7827	0.6272
AUD	1.0369	0.8074	0.6468
NZD	0.8263	0.6434	0.5155

Tools to create tables

excel2latex – Work in Excel use this macro to output the LaTeX code. excel2latex

calc2latex – Same for LibreOffice Calc. calc2latex

estout (Stata) – Export regression tables to LaTeX estout(Stata)

estout (R) – The same for Stata estout (R)

There are more!

This is just a tiny selection. Many statistics tools offer LaTeX-export or add-ons to do so. Before tediously copying all by hand, USE GOOGLE!

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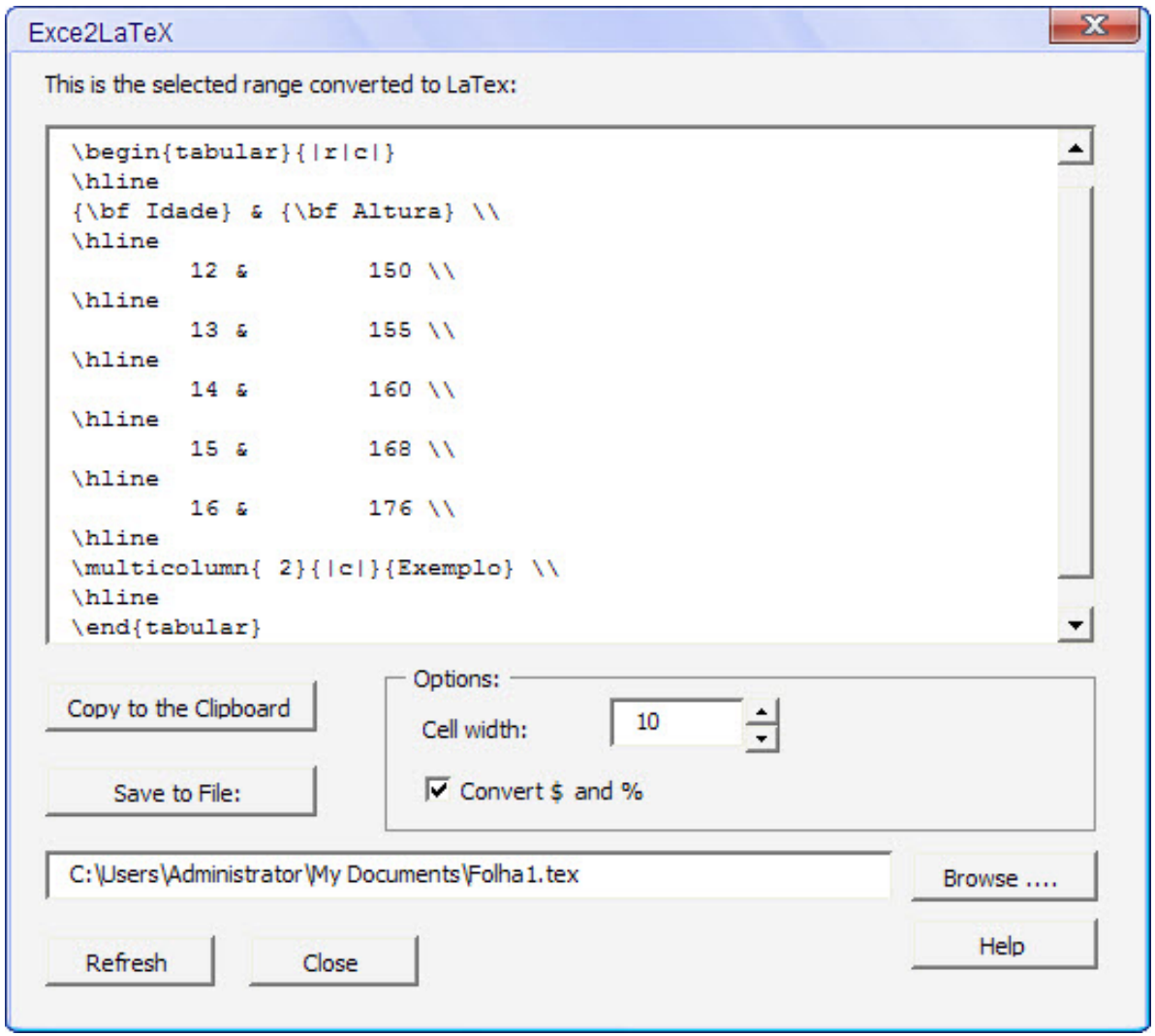
excel2tex / calc2tex



estout – table export from Stata or R

Table: Cigarettes on Body Weight

	(1)	(2)	(3)
	bwght	bwght	bwght
(Intercept)	115.44***	116.97***	116.83***
	[37.16]	[111.51]	[37.23]
cigs	-0.49***	-0.46***	-0.46***
	[-5.25]	[-5.06]	[-5]
motheduc	0.33*		0.01
	[1.42]		[0.06]
faminc		0.09***	0.09***
		[3.18]	[2.82]
R^2	0.02	0.03	0.03
N	1387	1388	1387

t-values in brackets

* $p < 0.2$, ** $p < 0.1$, *** $p < 0.05$

longtable – for tables longer than one page

. . . provides the `longtable` environment which breaks tables into pieces that fit document pages.

It encloses a tabular environment instead of the common tables environment. The rest is equivalent to a normal table.

No position parameters

DO NOT use positioning parameter (htbp) like for normal tables.

Those lead to compiling errors.

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`rotating` – for tables wider than normal

. . . provides the environment `sidewaystable` which turns the table by 90 degrees and puts it on a single page, allowing for a wider expansion.

Further provides `sidewaysfigure` with the same behavior.

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dcolumn – align the dots

. . . provides you with the ability to create new column types that center around given symbols. (You can center around the dot.)

D{#1}{#2}{#3}

- #1 – Separator in TeX-file.
- #2 – Output separator.
- #3 – Number of decimals.(If negative any number goes, but expansion very wide.)

dcolumn – 2

```
\newcolumntype{#1}[#2]{#3}
```

- #1 – Identifier of the new column. Used in the table orientation.
- #2 – Optional parameter if one wants to insert values manually.
- #3 – Column type definition (D...).

dcolumn – Code examples

Column name “d”; Dot in TeX; Center dot in output; Value for decimals.

```
\newcolumntype{d}[1]{D{.}{\cdot}{#1}}
```

Column name “.”; Dot in TeX; Dot in output; Unspecified decimals.

```
\newcolumntype{.}{D{.}{.}{-1}}
```

Column name “,”;Colon in TeX;Colon in output; Two decimals.

```
\newcolumntype{,}{D{,}{,}{2}}
```

Example – without dcolumn

Table: Cigarettes on Body Weight

	(1)	(2)	(3)
	bwght	bwght	bwght
(Intercept)	115.44***	116.97***	116.83***
	[37.16]	[111.51]	[37.23]
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R^2	0.02	0.03	0.03
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t-values in brackets

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Example – with dcolumn `D{.}{.}{3}`

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	bwght	bwght	bwght
(Intercept)	115.44***	116.97***	116.83***
	[37.16]	[111.51]	[37.23]
cigs	−0.49***	−0.46***	−0.46***
	[−5.25]	[−5.06]	[−5]
motheduc	0.33*		0.01
	[1.42]		[0.06]
faminc		0.09***	0.09***
		[3.18]	[2.82]
R^2	0.02	0.03	0.03
N	1387	1388	1387

t-values in brackets

* $p < 0.2$, ** $p < 0.1$, *** $p < 0.05$

Example – with dcolumn `D{.}{.}{3}`

Table: Cigarettes on Body Weight

	(1)	(2)	(3)
	bwght	bwght	bwght
(Intercept)	115.44***	116.97***	116.83***
	[37.16]	[111.51]	[37.23]
cigs	−0.49***	−0.46***	−0.46***
	[−5.25]	[−5.06]	[–5]
motheduc	0.33*		0.01
	[1.42]		[0.06]
faminc		0.09***	0.09***
		[3.18]	[2.82]
R^2	0.02	0.03	0.03
N	1387	1388	1387

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booktabs – make it thick not double

The common double lines to begin or end tables are nowadays considered to be not very elegant. A variation of the line thickness is to be prefered.  booktabs does this for you.

\toprule – top line of the table (thick).

\midrule – line to separate within the table (thin).

\bottomrule – bottom line of the table (thick).

Complementary

The above commands are complementary to the well known \hline. So mixing is possible.

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Complementary

The above commands are complementary to the well known \hline. So mixing is possible.

Example – without booktabs

Table: Cigarettes on Body Weight

	(1)	(2)	(3)
	bwght	bwght	bwght
(Intercept)	115.44***	116.97***	116.83***
	[37.16]	[111.51]	[37.23]
cigs	-0.49***	-0.46***	-0.46***
	[-5.25]	[-5.06]	[-5]
motheduc	0.33*		0.01
	[1.42]		[0.06]
faminc		0.09***	0.09***
		[3.18]	[2.82]
R^2	0.02	0.03	0.03
N	1387	1388	1387

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* $p < 0.2$, ** $p < 0.1$, *** $p < 0.05$

Example – with booktabs

Table: Cigarettes on Body Weight

	(1) bwght	(2) bwght	(3) bwght
(Intercept)	115.44***	116.97***	116.83***
	[37.16]	[111.51]	[37.23]
cigs	-0.49***	-0.46***	-0.46***
	[-5.25]	[-5.06]	[-5]
motheduc	0.33*		0.01
	[1.42]		[0.06]
faminc		0.09***	0.09***
		[3.18]	[2.82]
R^2	0.02	0.03	0.03
N	1387	1388	1387

t-values in brackets

* $p < 0.2$, ** $p < 0.1$, *** $p < 0.05$

Update your tables

1. apply the new packages to your tables
2. create a table that is longer than one page and apply `longtable`
3. create a very wide table and apply `sidewaystable`
4. reference the tables in your document

Bibliography using BibTeX

- Textbase database for bibliographic entries.
- Directly integrateable into LaTeX.
- LaTeX supports many styles of different journals directly, or they can be loaded from their website.
- Easy to call from within the document.

Simple example of a BibTeX entry:

```
@misc{ patashnik-bibtexing,
       author = "Oren Patashnik",
       title = {BIBTEXing with LaTeX},
       year = "1988" }
```

BibTeX – Usage

- Needs loading a package for the specific style and its commands.

```
\usepackage{natbib}
```

- Style has to be called.

```
\bibliographystyle{chicago}
```

- BibTeX-file has to be called (without file extension).

```
\bibliography{bib1}
```

Citation command

\cite(t){key} with full author list and year. e. g. Brown (1978) or Jarke et al. (1985)

\citep{key} within paranthesis. e. g. (Brown, 1978) or (Jarke et al. , 1985)

\nocite{key} insert sources which were not directly cited in the text.

natbib reference

BibTeX – Chicago style

Offers the following commands to cite in the text:

\citeNP{key} with full author list and year, but without enclosing parentheses: eg. Brown 1978; Jarke, Turner and Stohl 1985

\citeA{key} with only the full author list. eg. (Brown; Jarke, Turner and Stohl)

\citeANP{key} with only the full author list, without parentheses eg. Brown; Jarke, Turner and Stohl

Bibliography – step by step

1. import information to BibTeX-program (e.g. Mendeley)
2. export Bib-File to folder of the document (LaTeX uses *relative Paths* to determine the position of an import file.)
3. include package for bibliography handling (e.g.  `natbib`) in file header
4. choose style (e.g. \bibliographystyle{chicago})
5. include Bib-file `\bibliography{file}` (without file extension)
6. use `\cite{}` commands in text body
7. compile the document
8. run BibTeX (option in the editor menu)
9. recompile the document

Bibliography – step 7 – 8

Step 7

LaTeX reads the several calls of `\cite{...}` and stores them into a secondary file.

Step 8

BibTeX reads out the keys stored in the secondary file and collects the information stored in the Bib-File based on the stored keys (just them). Compiles a `thebibliography` environment in the correct layout based on the previously selected layout.

Bibliography – step 7 – 8

Step 7

LaTeX reads the several calls of `\cite{...}` and stores them into a secondary file.

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Bibliography – step 9

Step 9

LaTeX compiles the document replaces the `\cite{...}` calls with the correct intext citation, looks whether a fitting bibliography input file exists (`*.bbl`), and uses it to create the table of references.

Steps 7 – 9

Many editors offer these steps on the fly. They either offer an option, that always does all these steps, or they realize based on the document's content that multiple compilations and calls of additional programs are necessary.

Bibliography – step 9

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LaTeX compiles the document replaces the `\cite{...}` calls with the correct intext citation, looks whether a fitting bibliography input file exists (`*.bbl`), and uses it to create the table of references.

Steps 7 – 9

Many editors offer these steps on the fly. They either offer an option, that always does all these steps, or they realize based on the document's content that multiple compilations and calls of additional programs are necessary.

using BibTeX

Export a BibTeX file from Mendeley to your working directory.

And implement some citations in your text.

Define new commands

```
\newcommand{\name}[args]{defs}
```

name – name of the command.

args – number of arguments. Can be placed in the defs with number.

defs – definitions of behavior.

E.g.:

```
\newcommand{\tex}[1]{\Huge \LaTeX #1}
\tex{ is is great.}
```

LaTeX is great.

Define new environments

```
\newenvironment{name}[args]{beginning}{end}
```

name – name of the environment.

args – several arguments.

beginning – start of the environment.

end – end definition.

What you put in the newly defined environment is placed between `beginning` and `end` of the definition.

\pagestyle{} – normal styling

. . . influences the layout of a page.

empty – no headers, no footers

plain – no header, footer contains page number centered

headings – no footer, header contains name of chapter/section and/or subsection and page number

myheadings – myheadings no footer, header contains page number and user supplied information

\thispagestyle{}

. . . takes the same arguments as \pagestyle{} but only acts on the current page. On a titlepage it HAS TO be set directly below \maketitle.

\pagestyle{} – normal styling

. . . influences the layout of a page.

- empty – no headers, no footers
- plain – no header, footer contains page number centered
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- myheadings – myheadings no footer, header contains page number and user supplied information

\thispagestyle{}

. . . takes the same arguments as \pagestyle{} but only acts on the current page. On a titlepage it HAS TO be set directly below \maketitle.

fancyhdr – make the page fancy

. . . gives you control over the looks of the header and the footer of a page.

Per default it inserts the section to the right and the subsection to left in the header and draws a line under it. The page number is centered in the footer of the page.

Commands:

\lhead – left item in the header (or \chead or \rhead)

\lfoot – same for the footer (\cfoot, \rfoot)

fancy – is the new \pagestyle{fancy} option.

fancyhdr – 2

`\fancyhead[#1]{#2}` – defines headers based on rules. [#1] is an optional parameter that defines the position. {#2} takes the argument to appear.

E	even pages
O	odd pages
L	left
C	center
R	right

```
\fancyfoot{}
\fancyfoot[OR,EL]{\thepage}
```

puts the page number on *odd* pages in the footer *right*, on *even* pages in the footer *left*. Default hast to be cleared first.

hyperref – link it

. . . provides the possiblity to insert links into the output file. These links can be internal references or external hyperlinks to files or websites. If used, it automatically links all lists of contents, label+ref constructs, and bibliographical references.

\hyperlink{#1}{#2} – #1 = link address; #2 = alias (what appears in the text)

\href{#1}{#2} – same as above.

hyperref – 2

Colored boxes

Per default hyperref marks all links with colored boxes around the aliases in the text. You can switch this behavior using the `colorlinks=true` option, which uses the same colors to color the words directly.

Breaking links

Long links are not split to fit the textwidth. So links tend to "overexpand", to avoid this, use `breaklinks=true`.

hyperref – 2

Colored boxes

Per default hyperref marks all links with colored boxes around the aliases in the text. You can switch this behavior using the `colorlinks=true` option, which uses the same colors to color the words directly.

Breaking links

Long links are not split to fit the textwidth. So links tend to "overexpand", to avoid this, use `breaklinks=true`.

hyperref – hypersetup

. . . allows for customization of the hyperref options.

```
\hypersetup{colorlinks=true, linkcolor=black,
    citecolor=black, filecolor=black,
    pagecolor=black, urlcolor=black,
    bookmarks=true, bookmarksopen=true,
    bookmarksopenlevel=3, plainpages=false,
    pdfpagelabels=true}
```

The above command colors all links black and calls several other options. (So  `hyperref` can be used within a paper.)

Further recommended packages

- `amsmath` – provides further math environments
  - `amssym` – provides further math symbols
- `marvosym` – huge daily use symbol collection (Euro symbols)
- `tabularx` – provides an additional column parameter `X`. Its width is calculated so that the table spans the whole textwidth.
- `tocloft` – used to redefine layouts of the content lists. (e.g. if chapter numbers overexpand)

Commands – spaces

`\bigskip \medskip \smallskip` – little spacing

`\vspace{}` – defines a vertical distance to an element above.

`\hspace{}` – defines a horizontal distance to an element before in the same line.

`\vfill \hfill` – fills the space and move the below/behind element to the end of the page.

`\dotfill` – horizontally fills a line with dots

(NEED an element above/before.)

Commands – \setlength{length}{space}

\headsep – distance from bottom of the header to top of text.

\skip\footins – distance between top of footnote and bottom of text.

\footsep – distance between two footnotes.

\parindent – size of the indentation of the first line of paragraph.

\parskip – space above a new paragraph.

Commands – boxes

`\parbox[pos]{width}{content}` – invisible box of fixed width. Position either `t` or `b`.

`\mbox{content}` – *non breakable* box. Used for elements that cannot be broken apart.

`\framebox{width}[pos]{content}` – framed box of fixed width. Thickness controlled by `\fboxrule`, distance by `\fboxsep`.

`\fbox{content}` – expanding framebox. Does not allow line breaking.

Commands – boxes (2)

`\resizebox{width}{height}{content}` – scales a table or a figure according to `width` and `height`. `!` can replace one length parameter to scale in proportion.

`\scalebox{%}{content}` – the same as `resizebox` but as a ratio of the original size.

Both require the  `graphicx` to be loaded.

Commands – indentation and comments

`\marginpar{content}` – *"margin paragraph"* for some notes on the sidelines.

`\noindent` – removes paragraph indentation.

todonotes

. . . provides office like comment buubles in PDF output

- `\todo[author]comment`
- todo list option
- disable turns bubbles and todo list on and off

```
\usepackage[disable,shadow,colorinlistoftodos]{todonotes}
\todo[author=Felix,color=yellow!40]{comment}
```

Design comment bubbles

Imagine your work is correlaborative work with at least two members.

Write new commands for each individual that offer individually colored comment bubbles.

Commands – add entry to content list

`\addcontentsline{list}{level}{content}` – adds something to one of the contents holding lists.

list = `toc`, `lot`, `lof`

level = . . . , section, subsection, . . .

content = what is to appear in one of the lists

Commands – change counter values

`\setcounter{counter}{#}` – provides you with the ability to change the current or initial value of a counter. (To change the value in an `enumerate` environment put it *behind* the `\begin{enumerate}`.)

`counter`

thesection – section counter

thesubsection – subsection counter

enumi – enumerate counter

equation – all math environments with counter

Environments

`titlepage` – removes restrictions on the current page so that it can be designed to one's likings. (No header or footer.)

`abstract` – creates a small text environment wich is narrower than the normal textwidth.

`align` – math environment that allows for setting alignments and breaking lines. `\nonumber` in the beginning a line removes its formula counter.(Part of  `amsmath`.)

Split into smaller chunks

`\input{...}` – inserts the content of another TeX-file right at the spot. The file MUST NOT contain a header or body definition. The name is the file name WITHOUT its extension.

`\include{...}` – inserts the contents of another TeX-file on a new page. The file MUST NOT contain a header or body definition. The name is the file name WITHOUT its extension.

`\includegraphics[options]{file}` – from graphicx

`options`

width= – file width in document.

height= – graphics height.

Scaling

It is sufficient to define one of the two, the rest scales accordingly.

Useful commands for the right scale are `\textwidth` or `\textheight`. These two might als be multiplied by a factor.

E.g. `.7\textwidth` = 70% of text width.

includegraphics

options

`clip=true` – default value is *false*. Needed if cutting something from the original image.

`viewport= llx lly urx ury` – *viewable portion* if cutting from an image.

- llx – lower left x coordinate
- lly – lower left y coordinate
- urx – upper right x coordinate
- ury – upper right y coordinate

`page=#` – when cutting from a multipage PDF you need to provide the page number.

```
\includegraphics[page=6,height=.7\textheight]{img/Sinn-2010-Euro-Krise}
```

6 **Kommentar**

Abb. 3
Zinssätze für 10jährige Staatsanleihen

Quelle: Reuters Ecowin.

landkrise, drohten die alten Verhältnisse zurückzukehren. Die Vorteile, die man vom Euro erwartet und lange Zeit auch erhalten hatte, schwanden dahin. Das und nichts anderes war der Grund für die Alarmstimmung der Schuldenländer. Die Alarmstimmung dieser Länder gesellte sich zur Furcht vor weiteren Kursverlusten auf Staatspapiere in den Gläubigerländern hinzu und erzeugte den politischen Druck, aus dem heraus die Hilfsaktionen entstanden.

Abbildung 3 zeigt eindeutig, dass es keine Krise des Euro an sich gab, sondern nur eine Krise in jenen Ländern, die als Gläubiger hohe Kursverluste oder als Schuldner hohe Zinslasten für Neuemissionen zu erwarten hatten. Die Alarmstimmung war subjektiv verständlich, doch eine Systemkrise, die dem Artikel 122 des EU-Vertrages entsprach, gab es nicht. Das gilt umso mehr, als die Zinsunterschiede bei den Ländern, auf die sich das Gewährleistungsgesetz bezieht (also die Euro-Länder ohne Griechenland) noch lange nicht so groß wie vor der Einführung des Euro waren. Der mit der Ländergröße (BIP) gewichtete Durchschnittszins der betroffenen Euroländer (ohne Griechenland) lag am 7. Mai 2010 um 0,78 Prozentpunkte über dem deutschen Zins. Im Jahr 1995 hatte er indes um 1,87 Prozentpunkte darüber gelegen, also bei mehr als dem Doppelten.

Die EU behauptet, es habe ein Komplott von Spekulanten gegeben, die die Kurse der Euroanleihen gezielt hätten drücken wollen. Auch die deutsche Bundesregierung hat sich dieser Lesart der Krise angeschlossen. Es fehlt aber jeglicher Beleg dafür, dass es eine Gruppe von Spekulanten gab, die stark genug war, durch ihre Marktaktionen den Kurs der Euro-Papiere gezielt verändern zu können. Richtig ist nur, dass die gewachsene Angst vor Staatsinsolvenzen und Schuldenmoratorien, auch die nachrangige Positionierung ihrer Ansprüche hinter denen des IWF, die Kapitalanleger zu einer Neubewertung der Risiken veranlasst hat, was insbesondere die französischen Banken in Schwierigkeiten brachte, die um zwei Drittel mehr griechische Wertpapiere hielten als deutsche Banken und zudem noch griechisches Bankeigentum besaßen. Aber das war eine natürliche Entwicklung der Kapitalmärkte und kein Komplott. Was die meisten Ländervertreter als Krise empfanden, war eine notwendige Ausdifferenzierung der Zinsen nach der Bonität der Kreditnehmer, die ein Stück weit wieder in die Richtung der Vor-Euro-Zeit ging, aber keinesfalls eine ähnliche Dramatik wie seinerzeit aufwies.

Die Behauptung, es habe eine Systemkrise des Euro vorgelegen, war ganz offenkundig interessengeleitete Semantik zur Durchsetzung des Gewährleistungssystems auf der Basis des Artikel 122 des EU-Vertrages. Dieses Gewährleistungssystem verspricht den Käufern der Staatsanleihen der Schuldnerländer hohen Anlageschutz, den Inhabern der bereits emittierten Papiere Kursgewinne und den Verkäufern neuer Staatsanleihen niedrigere Zinsen. Deutschland, welches die Hauptlast der Gewährleistung zu tragen hat, hilft seinen Konkurrenten auf dem Kapitalmarkt, sich wieder billiger zu verschulden.

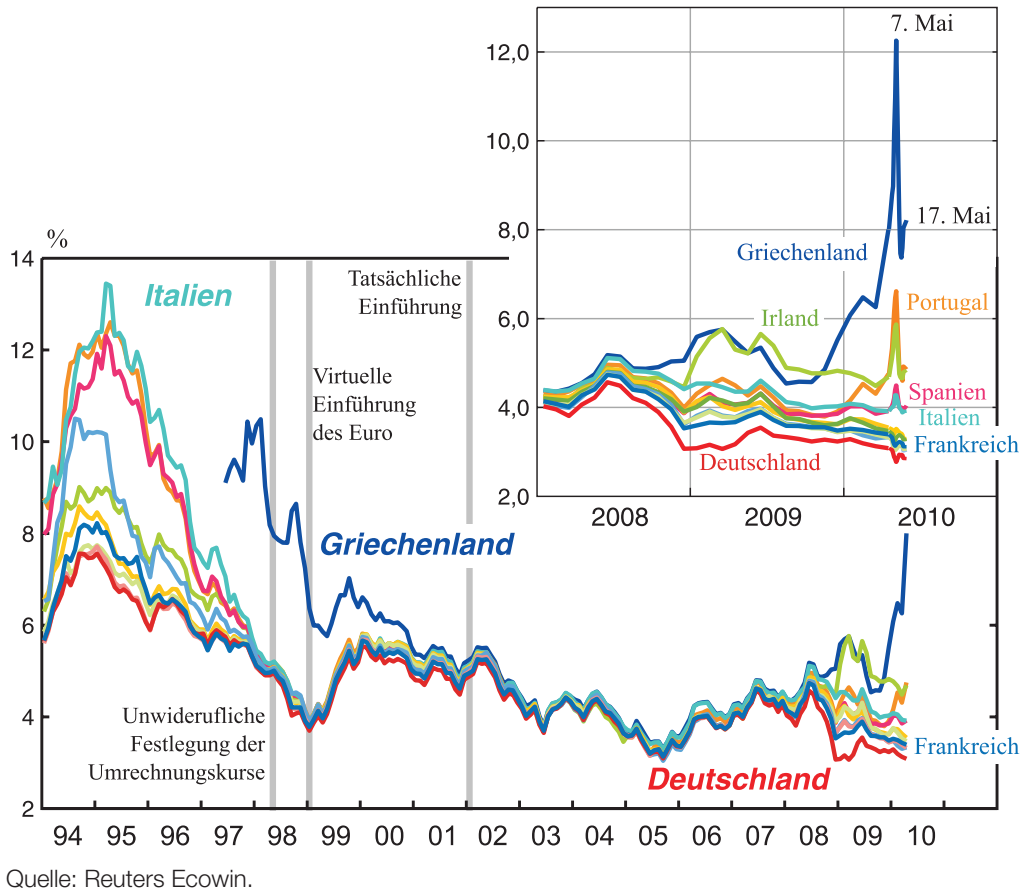
Die Bürgschaft, die Deutschland zur Verfügung stellt, hätten die Schuldenländer auch auf dem Kapitalmarkt in Form von CDS-Versicherungen oder Avalkrediten kaufen und den Käufern ihrer Staatspapiere zur Verfügung stellen können. Dass nun Deutschland diese Bürgschaften kostenfrei bereitstellt, ist für die Schuldenländer eindeutig die billigere Alternative. Deutschland erbringt eine Versicherungsleistung von geldwertem Vorteil, für die es nicht bezahlt wird.

Volkswirtschaftliche Bewertung

Abgesehen von dem Umstand, dass Deutschland die Bürgschaften umsonst bereitstellt und möglicherweise hohe Lasten tragen wird, wenn es später darum geht, die Insolvenz mit weiteren EU-Hilfsprogrammen zu vermeiden, hat das Gewährleistungsgesetz äußerst problematische Auswirkungen für die Wachstumsdynamik unseres Landes. Dieses Thema ist wichtiger als die Frage, ob die Bürgschaften eingelöst werden oder nicht.

Figure: Sinn - Eurokrise

```
\includegraphics[page=6,height=.7\textheight,clip=true,viewport=20 430 350 680]{img/Sinn-2010-Euro-Krise}
```



Quelle: Reuters Ecowin.

Figure: Sinn - Eurokrise

\DeclareGraphicsExtension{.jpg,.png}

. . . is offered by the graphicx package. All extensions entered here are recognized by default as graphical extensions so that in \includegraphics{} only the filename has to be used.

psfrag – replace text in postscript files

`\psfrag{PS-text}{replacement}` – `PS-text` is the text that is to be replaced. `replacement` is your LaTeX text. (Commands have to be placed BEFORE the graphic is called.)

Compiling

Using `psfrag` you need to compile `DVI -> PS -> PDF`.

psfrag – replace text in postscript files

`\psfrag{PS-text}{replacement}` – `PS-text` is the text that is to be replaced. `replacement` is your LaTeX text. (Commands have to be placed BEFORE the graphic is called.)

Compiling

Using `psfrag` you need to compile `DVI -> PS -> PDF`.

psfrag

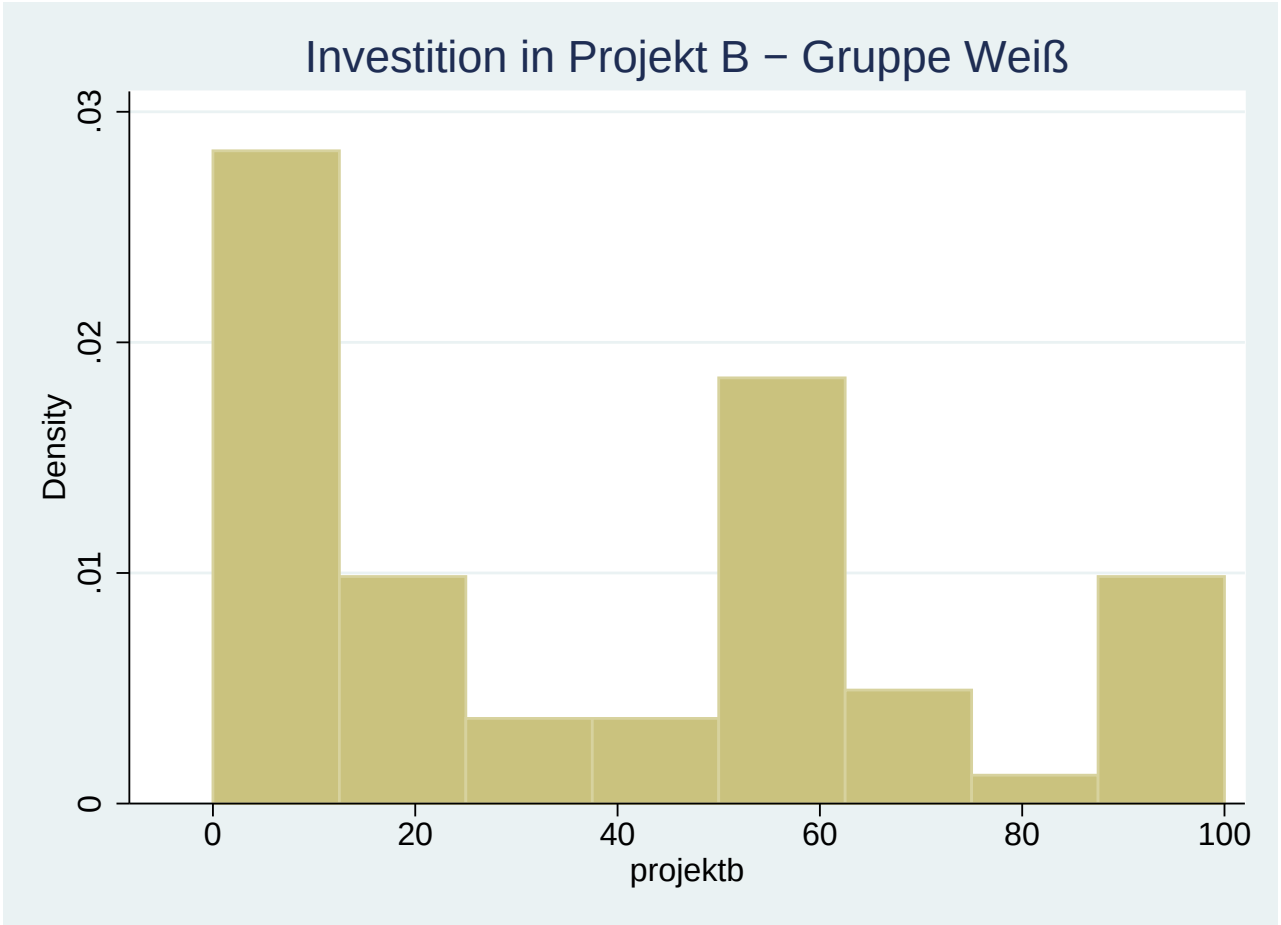


Figure: Stata Graph

psfrag

Figure: Stata Graph

psfrag

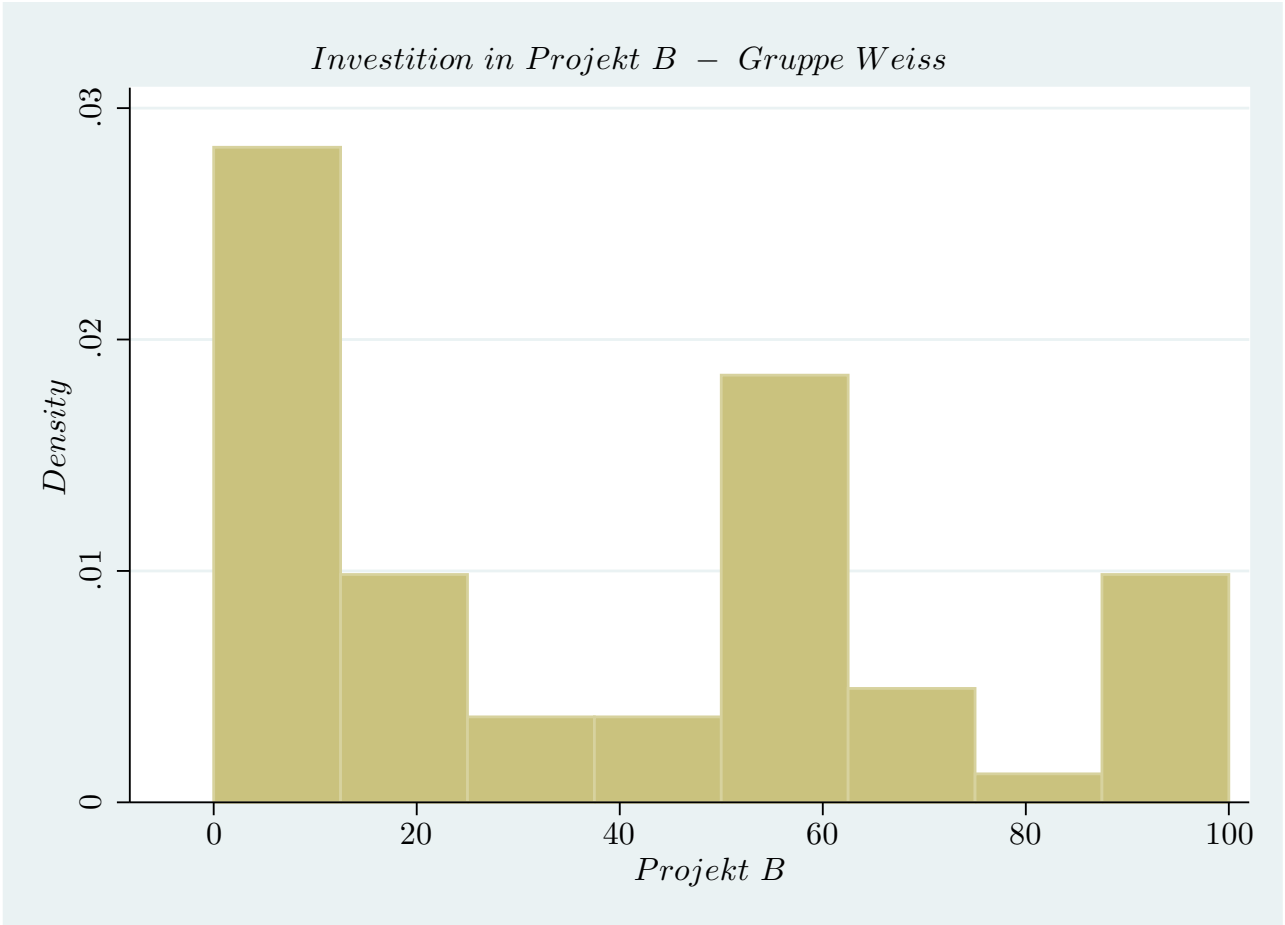


Figure: Stata Graph

epstopdf

. . . converts included Postscript graphics or files *on the fly* to PDF when compiling with pdflatex or pdfTeX.

Warning!

This package disables  psfrag

epstopdf

. . . converts included Postscript graphics or files *on the fly* to PDF when compiling with pdflatex or pdfTeX.

Warning!

This package disables psfrag

pdfpages – include whole pages

. . . makes it possible to extract and include whole PDF pages or ranges of pages into the current document.

```
\includepdf[key=val]{file}
```

pages={3,4,{},6-9} – which pages as either a comma separated list or *from to list* via a "'-"'.

Inkscape

Windows / Mac:

- Inkscape
- Ghostscript – provide Postscript conversion
- pstoedit – converts PS to SVG
- How to set System path.

Linux:

- Inkscape
- pstoedit

Inkscape – lines

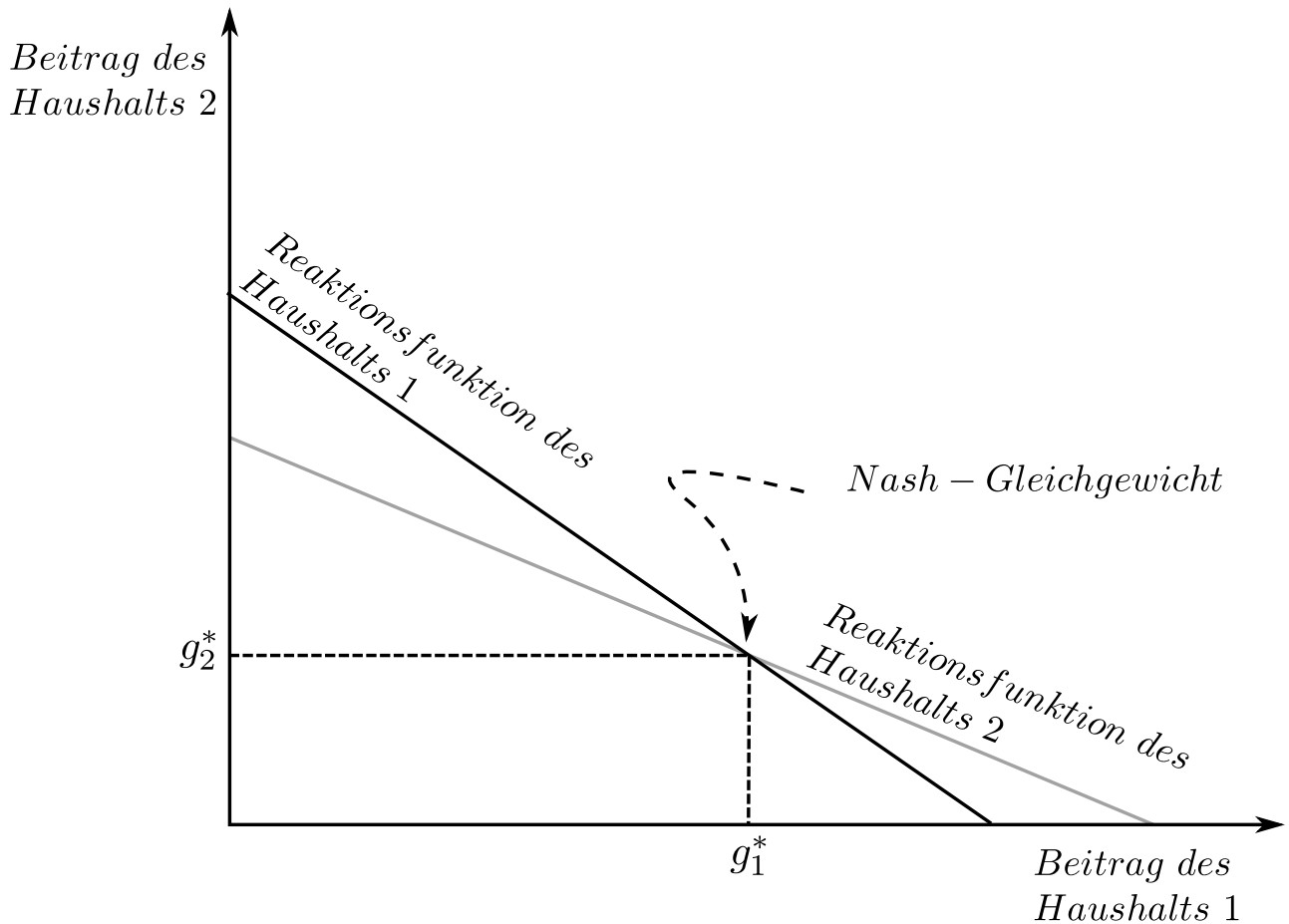


Figure: Nash-Gleichgewicht

Inkscape – curves and

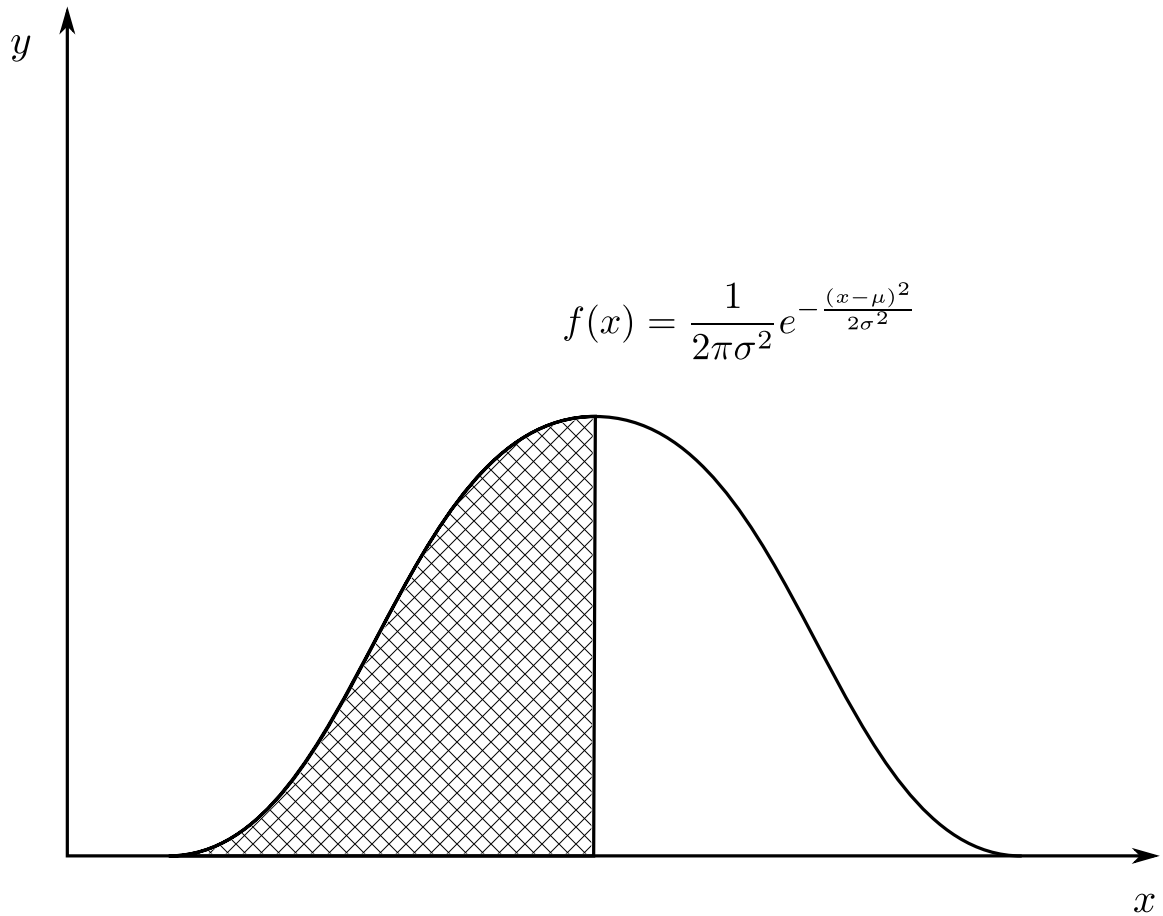


Figure: Normal Distribution

Inkscape – graphics

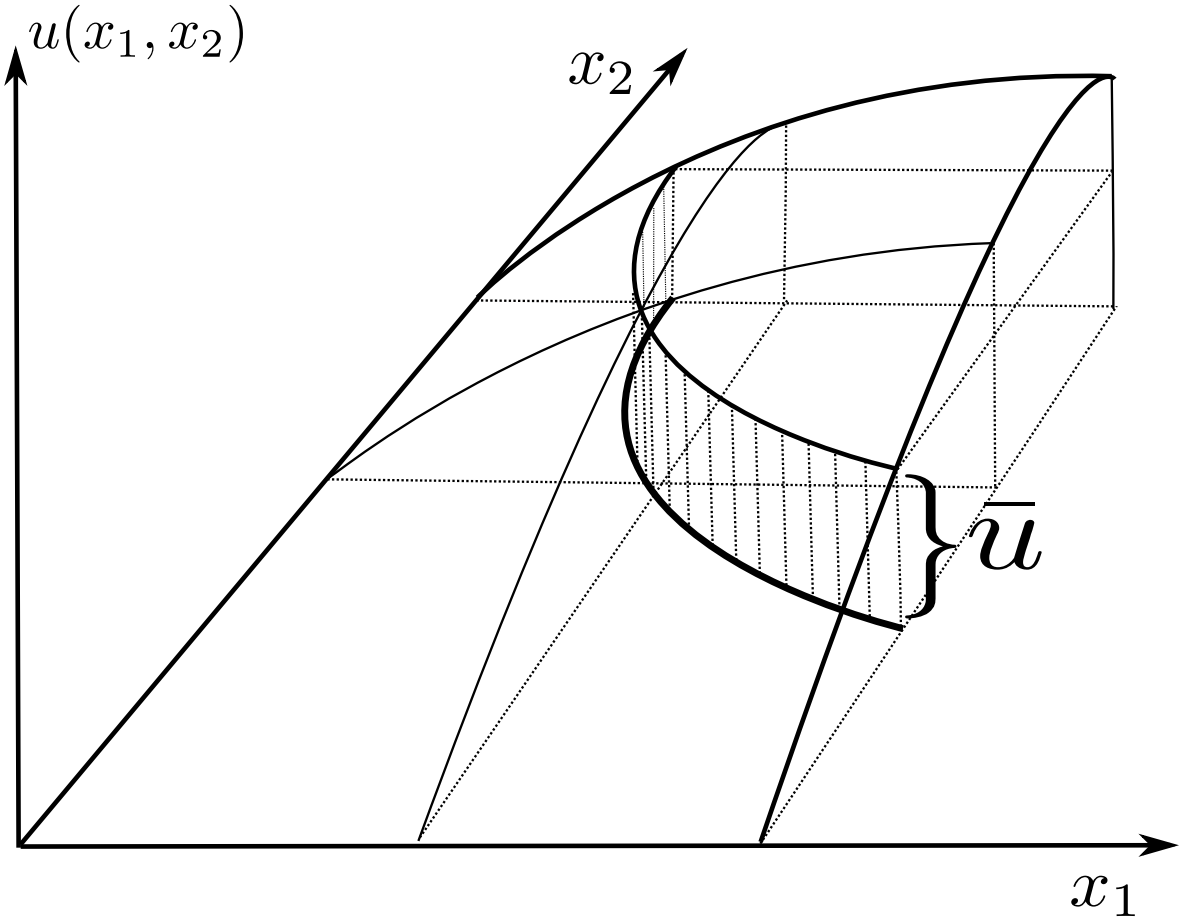


Figure: Utility mountain

Basic Slides

What do you need?

documentclass – `beamer`

environment – `frame`

command – `frametitle`

Content

Content is written within the `frame` environment.

Standard commands apply. (Exception structuring commands.)

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Content is written within the `frame` environment.

Standard commands apply. (Exception structuring commands.)

Example

```
\begin{frame}{Slide 1}
    \begin{itemize}
        \item Punkt 1
        \item Punkt 2
        \item Punkt 3
    \end{itemize}
\end{frame}
```

Slide 1

- Punkt 1
- Punkt 2
- Punkt 3

Columns

environment – columns

command – column{width}

```
\begin{columns}
    \column{.5\textwidth}
    Col 1\\
    Col 1 \dots
    \column{.5\textwidth}
    Col 2\\
    Col 2 \dots
\end{columns}
```

Example – 2 columns

Col 1

Col 1 . . .

Col 2

Col 2 . . .

Structuring commands

Beamer supports `section` and `subsection`.

- Have to be placed **outside** the `frame` environment.
- Structure appears at the navigation side- or top-pane.
- Appearance depends on chosen style.

Animation

Important

- not *real* animation
- automated generation of several PDF-slides (pages)

command – `pause`

- *pauses* show up of following elements

tag – `<2->`

- offers specific show up "timing"

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Animation

command – `\only<tag>` - code is only compiled for THAT slide

– `\uncover<tag>` - unhides element at this point (no jumping)

Example – Animation

```
\begin{itemize}
    \item Nr 1
        \pause
    \item Nr 2
\end{itemize}
\begin{itemize}
    \item<2,5,8> We
    \item<3,6,9> will
    \item<4-> rock
    \item<5,7> you
\end{itemize}
```

Example Animation

- Nr 1
- Nr 2
- We
- will
- rock
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Evasion-Graph

```
\includegraphics<1|handout:0>[height=.8\th]{img/evasion1}
\includegraphics<2|handout:0>[height=.8\th]{img/evasion2}
\includegraphics<3|handout:0>[height=.8\th]{img/evasion3}
\includegraphics<4|handout:0>[height=.8\th]{img/evasion4}
\includegraphics<5|handout:1>[height=.8\th]{img/evasion5}
```

Evasion-Graph

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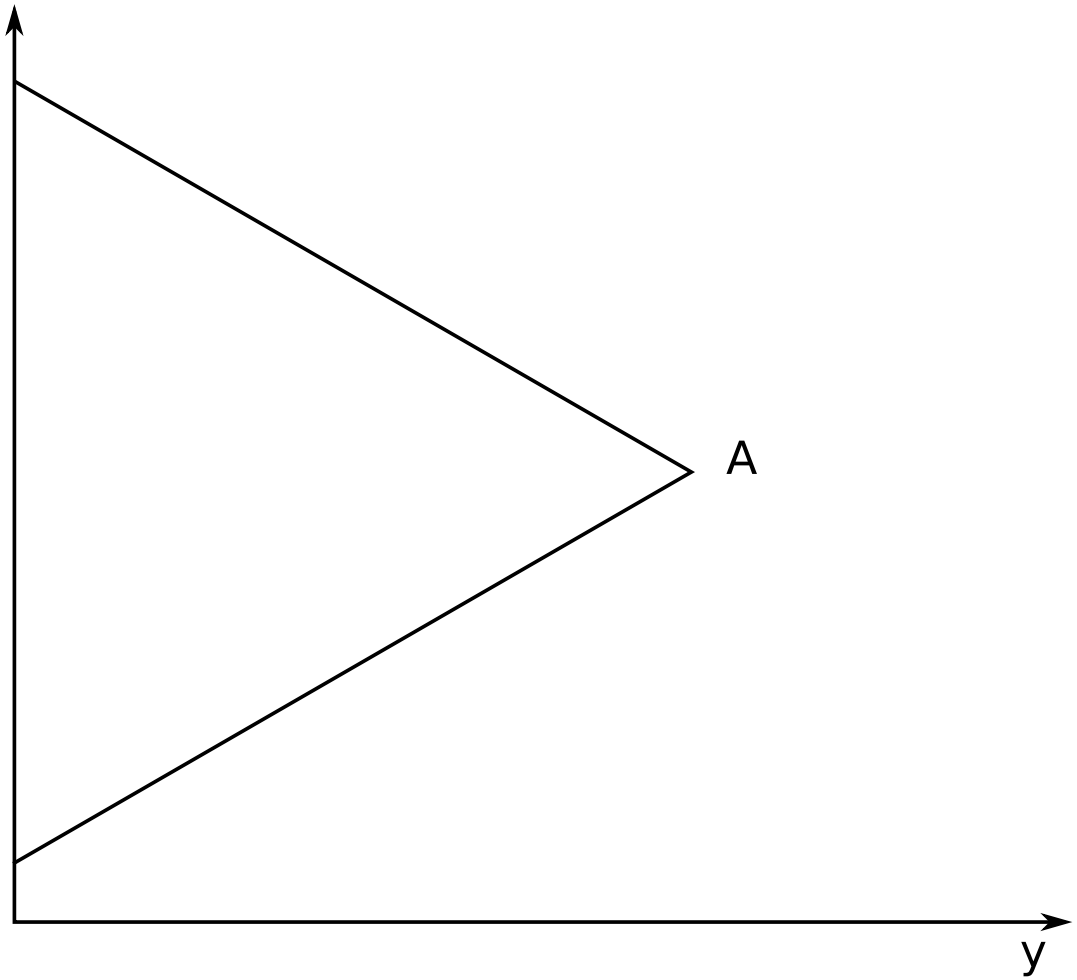
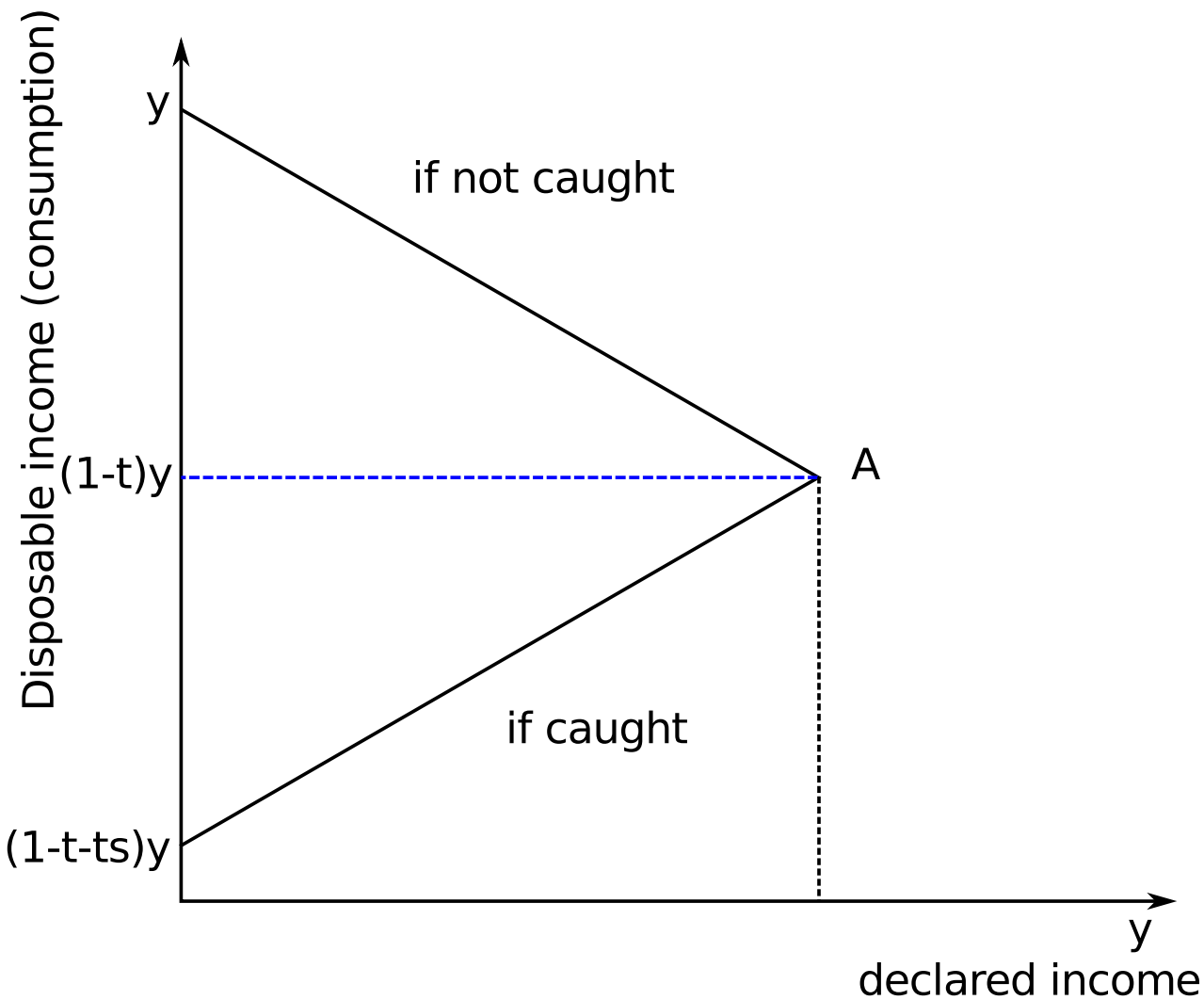
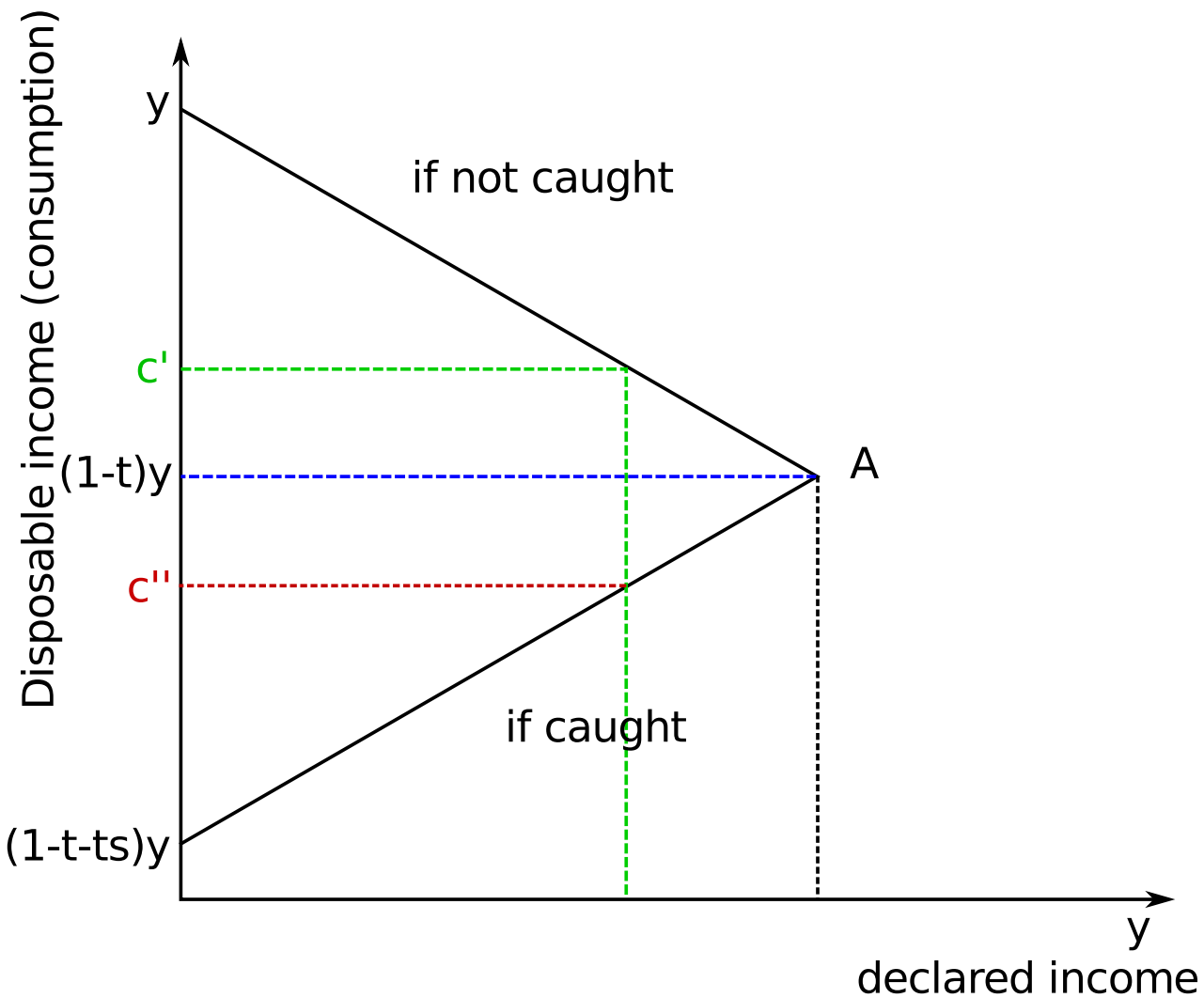


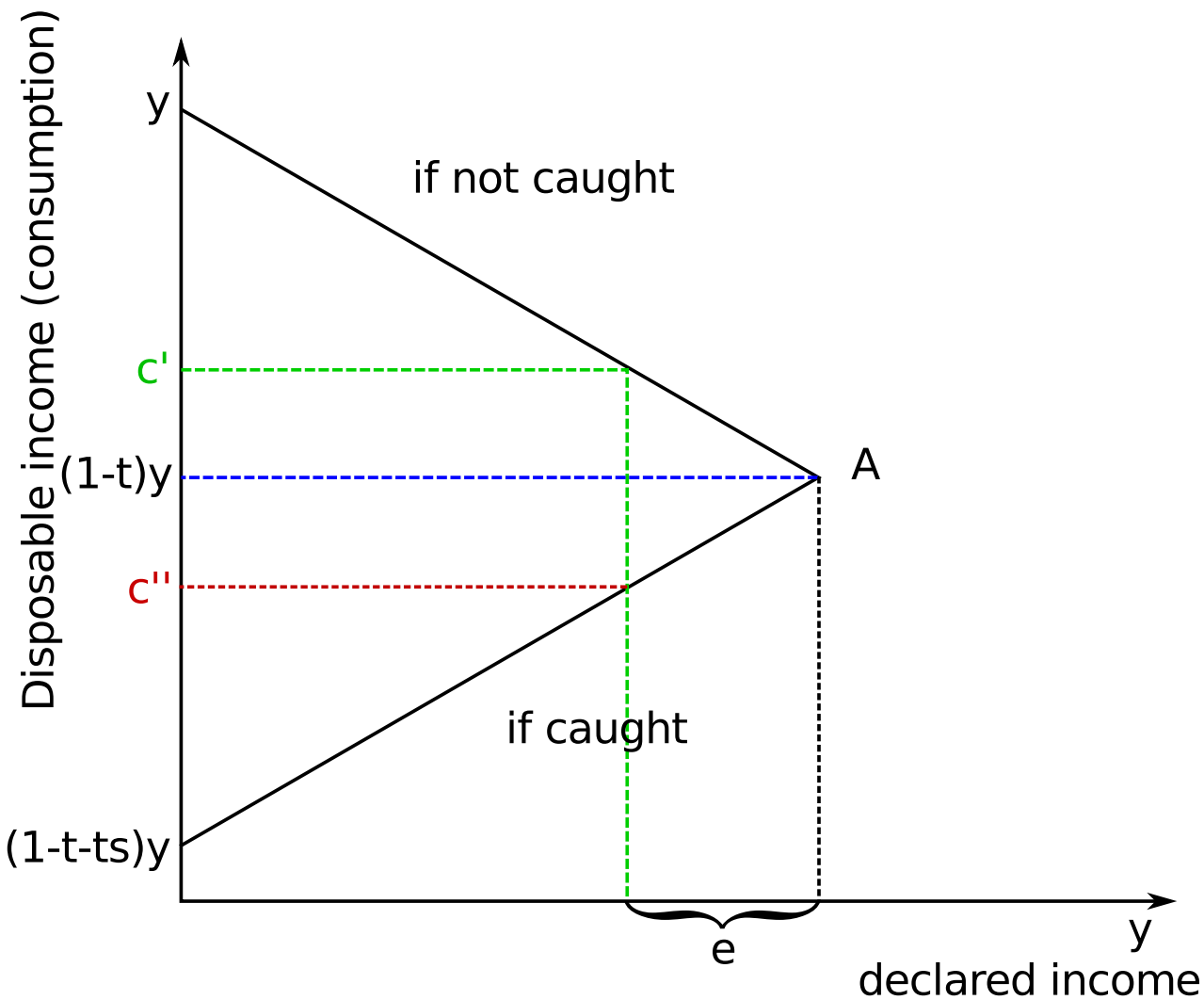
Evasion-Graph



Evasion-Graph



Evasion-Graph



@alert

- enables you to highlight important points
- integrates with the animation tag
  - e. g. `<alert@1>`

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Blocks

General block

```
\begin{block}{title}
    Content
\end{block}
```

Blocks

Example block

```
\begin{exampleblock}{title}
    Content
\end{exampleblock}
```

Blocks

Alert block

```
\begin{alertblock}{title}
    Content
\end{alertblock}
```

Tables

- `colortbl`
  - `\cellcolor{color}` (requires column definition)
  - `\rowcolor{color}`
  - `\colcolor{color}`

Colors

- `xcolor` – already used by beamer class
  - mixing: rgb,cmyk,color names and mix ratios
  - `\definecolor{new name}{mix}`

e.g. `\xdefinecolor{tcom}{rgb}{150,0,150}`

This is written with color 'tcom'.

Example – tabular more column alignments

```
\begin{table}
    \centering
    \begin{tabular}{p{7ex}|r|l| *3{c}}
        Test & 3 &76 &  \only<1,3>{\cellcolor{red!40}}3 & 3 & 3\\
        \only<2->{\rowcolor{blue!40}}
        Hallo & 4 & 89 & 4 & 6 & 8\\
        Na & 5 & 78 & 4 & 5 & 5\\
    \end{tabular}
    \caption{Caption}
    \label{tab:3}
\end{table}
```

Example – tabular more column alignments

Test	3	76	3	3	3
Hallo	4	89	4	6	8
Na	5	78	4	5	5

Table: Caption

Example – tabular more column alignments

Test	3	76	3	3	3
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Table: Caption

Styling

- ready made styles available
- command `usetheme{theme name}` e. g.
  - PaloAlto
  - Marburg
  - Berlin
- command ONLY in header

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Class options

compress – some styles offer a *compressed* version of the structure nav-pane

handout – smooshes *animated* slides into one

Many more options. Refer to the beameruserguide.pdf!

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Useful links

Books

- Wikibooks LaTeX

Languages

- Tutorial for Chinese/Japanese/Korean in LaTeX
- Arabic using LaTeX

Graphics/Styling

- LaTeX Font Catalogue
- Graphical Programming Language 'TikZ/PGF'
- JAVA based Formula Plotter 'Geogebra'
- KOMA Script

The End