

ALBERT-LUDWIGS-UNIVERSITÄT FREIBURG

M. Sc. Economics

Title

Master Thesis

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Abstract

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

Keywords: L^AT_EXTemplate, Master's Thesis, Master of Science in Economics Program, University of Freiburg

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List of Acronyms

ALUF	Albert-Ludwigs-Universität Freiburg
APA	American Psychological Association
MEP	Master of Economics Program

List of Symbols

β	discount factor
c	consumption
l	labor
R	real return
t	time period
u	utility function

Template Documentation

This is a primary *unofficial* template for the Master’s thesis in the [Master of Economics Program](#) at the University of Freiburg. My name is Zhiyuan Qiu, and I built this document for personal use when working on my own thesis. Feel free to drop me an email (zhiyuan.qiu@outlook.com) or visit the [GitHub repository](#) of this template should you have any questions.

The layout and design of this template are based on the guidelines of the Master’s thesis at the MEP official website: <https://master.econ.uni-freiburg.de/students/procedures>, particularly this document: <https://master.econ.uni-freiburg.de/data/master-thesis-guidelines-20191127.pdf>

Nevertheless, the detailed specifications may vary in different Chairs and changes in the regulations. Discussing with your supervisor regarding these is therefore necessary.

The rest of this chapter is mostly for those new at L^AT_EX – I will give a brief introduction of the template structure, along with some instructions on a few simple but essential commands that you may have to use when writing the thesis. **For L^AT_EX experts** – I commented a lot in the preambles to prevent myself from forgetting their functions, so starting from the commands directly should be quite straightforward for you.

The best thing about L^AT_EX for me is that it’s a *one-and-done* typography – even across platforms. Once you have set up a document, it remains strictly static and precise throughout your writing process. Switching from one style to another (commonly, e.g., the citation styles) is also highly efficient and dependable with only one or two lines of commands.

I had the completely opposite experience when using MS Word. There were often some unexpected layout problems coming out when I switched to another PC, slightly changed the settings, or switched to a different version of the software. I also had to use another software just for citations and bibliography, which might produce unexpected problems as well if, for instance, I switched the bibliography style. From my perspective, for documents with complex structure and large amount of text, L^AT_EX is apparently more reliable.

In addition, \LaTeX is professional and elegant in displaying math formulas, theorems, tables, etc., while they are easy to be set up. It helps especially when you need to demonstrate your expertise and formality in the document.

It may seem difficult to start with \LaTeX at first glance, mainly because it is not a What-You-See-Is-What-You-Get editor, like MS Word. It even seemed like programming to me when I first got into it. But you do not need to know all the commands by heart. You will need merely a simple understanding before enjoying hassle-free academic writing and automated elegant typesetting.

0.1 Template Structure

As you can see, The basic components of a \LaTeX document are files with the *.tex* extension. They contain a mixture of *commands*, which format the text or pages, and *text*, which is the actual content. Apparently they are not what you would submit to the university - All these files are used to compile a PDF file, which is your final document.

I separate the numerous commands into various *.tex* documents based on their respective functions. Below is an overview:

- **Main.tex**: the root document you should set in the editor to compile a PDF. It is also the main file to put all documents together, where you choose which to include and which not.
- **thesis_info.tex**: where you customize the thesis title, you and your supervisor's names, your matriculation number, etc.
- **preamble.tex**: the file to put all settings and preferences together, including layout, fonts, citation styles, etc. See more in [Section 0.2](#).
- **Make.bat**: MS Windows batch files to compile the source files into a PDF on your PC, without opening them in an editor. It uses the [latexmk](#) package, compiles the document based on your preferences and deletes external/auxiliary files (e.g. *.aux*, *.log* files, etc.) afterward. You need to further install the [Strawberry Perl](#) environment to run it. I built this only to get rid of those auxiliary files during the compilation.
- **Folder '0_Preamble'**: specific settings and preferences. Each *.tex* file within is responsible for one category, as their file names indicate.

- **Folder ‘1_Title_Page’:** contains two versions of title page for the thesis. Both follow the exact same layout as the official MS Word templates on the [program’s website](#). Particularly:
 - **titlepage_legacy.tex** (2014-2023): <https://master.econ.uni-freiburg.de/data/master-thesis-title-page-2014.doc>
 - **titlepage.tex** (2023-who knows): <https://master.econ.uni-freiburg.de/data/deckblatt-abschlussarbeit-economics.docx>

By default, the template uses the new one since the old one has been removed from the website already. I keep it just in case of necessity.

Important: normally you would not need to change anything in these two files. You change the information on the title page by altering the **thesis_info.tex**.

- **Folder ‘2_Contents’:** contains *.tex* files for all parts and chapters, where you will input the main body of your thesis.
- **Bib/BibFile.bib:** where you will store all the article citation information (in `BIBTEX` format). The official website of a journal article often provides the option to download the citation information in `BIBTEX` format and you can copy paste straightaway. [Section 0.3.18](#) provides a detailed instruction regarding this.
- **Folder ‘Fonts’:** contains necessary font files.
- **Folder ‘Graphics’:** for storing images for the thesis. I put the university logos for the title page here.
Recommendation: try to use vector graphics whenever you want to insert an image in the thesis.

0.2 Template Setups

Long story short: if you are completely new to `LATEX`, make sure to only use **X_YL^AT_EX compiler + Biber bibliography tool** when using this template. No need to change any other settings explained in this section.

The template is compatible with all 3 commonly used compilers: `pdfLATEX`, `XYLATEX`, and `LuaLATEX`. However, since `pdfLATEX` has low support for customizing fonts (e.g. *Times New Roman* that is used right here), **I recommend using**

X_YLaTeX or LuaLaTeX compilers if possible for optimal appearance.

Two ways to use:

- **Online LaTeX editors**, such as [Overleaf](#). There you can change the compiler preference in the upper left corner, under *Menu* → *Settings* → *Compiler*.
- **Local LaTeX editors** to edit the source files on your PC. There are many of them to choose, like [TeXstudio](#), [Texmaker](#), [Kile](#), etc., which usually require an external compiler such as [MiKTeX](#) or [TeX Live](#). The compiler preference can be changed in the editor settings. For example TeXstudio: Options > Configure TeXstudio > Build > Default Compiler > XeLaTeX.

Since *Times New Roman* is not supported by the pdfLaTeX compiler, I set a Times clone font in case you use it. However, it would not be easy if you want to customize another font. That is why I suggest using X_YLaTeX/LuaLaTeX compilers - you can set any font installed on your PC as the font of the document by putting its name in the ‘\setmainfont{’}’ bracket in **fonts.tex**.

The bibliography/citation styles are:

- [APA \(American Psychological Association\)](#) - *Author (Year)*

supported by the [BibLaTeX](#) package. It also supports a variety of other styles including *AIP*, *Chicago*, *IEEE*, *Nature*, *Science*, etc. by simply altering the ‘style=’ package option. **Make sure you are using *Biber* to compile in your editor.**

Since the *APA* citation style provides the ‘Bibliography’ title instead of ‘References’ by default, I use the ‘\nocite{*}’ command in **Main.tex** to allow all the materials in **BibFile.bib** to be included in the bibliography, regardless of whether they are cited or not.

If you need to separate multiple *.bib* files for categorizing literature, in **bibliography.tex** include their file names in the \addbibresource command by adding commas behind, e.g. ‘\addbibresource{Bib/Bib1, Bib2}’.

The [screlayer-scrpage](#) package offers customized headers and footers, by default there would be only the page numbers at footers. The total number of pages is displayed together with the current page number and is determined by the last page of [Chapter 6](#): Conclusion. The current section and chapter title are displayed at the upper left and the bottom, respectively.

In **layout.tex**, I left several commented commands that set a similar headers and footers’ layout, but using the [fancyhdr](#) package. KOMA-Script officially does not recommend this package in its document classes as they are not fully compatible, though you can still use them with warnings produced.

0.3 Commands for Writing

When writing with \LaTeX , your content will be a mixture of commands and the text you wrote. For instance, if you want to highlight a word in a sentence, say “*Hello* world!”, what you would write in the *.tex* file will be:

```
\emph{Hello} world!
```

This is why you need to know the following essential commands that I will introduce you to.

I try to cover all the commands I have used for my own thesis, but apparently I cannot be all-inclusive. Therefore, it is always nice to look for answers online. I recommend some useful websites in [Section 0.4](#).

0.3.1 Labeling

As you may see later on, the `\label{}` command is frequently used in \LaTeX . This is because \LaTeX is powerful in cross-referencing elements of your documents, including chapters, sections, tables, images, math equations, etc., for instance:

```
\Cref{docsec:commands}, \Cref{docfig:UniLogoClassic}, \Cref{doceqn:Euler}
```

[Section 0.3](#), [Figure 1](#), [Equation \(1\)](#)

\LaTeX can automatically recognize elements, name them, and provide hyperlinks to them when using the above commands. This all assumes you labeled these elements beforehand. I will introduce the cross-referencing and citing in detail in [Section 0.3.18](#).

0.3.2 Create a new chapter

1. Create a new *.tex* file under the ‘**2_Contents**’ folder and include the following command at the very beginning:

```
\chapter{Chapter Title}\label{Chapter Label}
```

Change `Chapter Label` in the command to some text you can remember.

2. Include this chapter file in **Main.tex**:

```
\include{2_Contents/File name of the new chapter}
```

0.3.3 Create an unnumbered chapter

```
\chapter*{Chapter Title}
```

In this way, the chapter will not be automatically included in the *Table of Contents*. To add it manually, add the following subsequently:

```
\addcontentsline{toc}{chapter}{Chapter Title}
```

Remember to change Chapter Title in the command accordingly.

Unnumbered chapters in this template are the appendices and certification. You can see that different from normal chapters, they do not have the numeral in the chapter title.

Normally you do not need to create another such chapter.

Referencing an unnumbered chapter will look weird and is not recommended. Consequently, you do not need to label it.

0.3.4 Create a section/sub-section under a chapter

Similarly, add the following command in the chapter .tex file:

```
\section{Section Title}\label{Section Label}
```

Change Section Label in the command to some text you can remember.

For a sub-section, replace \section by \subsection.

0.3.5 Break lines / Divide paragraphs

```
\\
```

for line breaking and:

```
\par
```

for paragraph dividing. Add one of them where the text breaks.

For dividing paragraphs in text, simply use the latter only. You are most likely to use the former when dealing with multiple-line math formulas and tables (see [Section 0.3.15](#), [0.3.16](#), and [0.3.17](#)), or (rarely) when you have to force line breaking. See [this](#) for detailed explanation.

0.3.6 Special characters: “, “”, %, &, __, etc.

Similar to programming languages, the following ten characters have special meanings and L^AT_EX will recognize them as parts of commands:

```
1 & % $ # _ { } ~ ^ \
```

To display them as normal text in the document, *you should prepend a backslash for the first seven of them*:

```
1 A total of 50\% of residents were opposed.
```

A total of 50% of residents were opposed.

And use special commands for the last three of them:

```
1 \textasciitilde, \textasciicircum, \textbackslash
```

~, ^, \

For quotation marks, their two parts are represented by two different characters in L^AT_EX: ` (grave accent symbol) as the first one and the single quotation mark ' as the second one. The former usually shares a keyboard key with the Tilde ~ at the upper left corner.

```
1 The ``text'' is enclosed in double quotes. \par
```

```
2 The `text' is enclosed in single quotes.
```

The “text” is enclosed in double quotes.

The ‘text’ is enclosed in single quotes.

0.3.7 Acronyms and Symbols

If you need to include formal acronyms and symbols, you should declare them first in **glossaries.tex** in the ‘0_Preamble’ folder. I have defined a few examples for you to see how it works. The automake package option is used to automake glossaries using T_EX’s shell escape to display lists of acronyms and symbols.

By default, all defined acronyms and symbols, whether used in the thesis or not, will be on the lists of acronyms and symbols. If you want only the used ones appear, delete the \glsaddall command in **glossaries.tex**.

- Define an acronym:

```
1 \newacronym{label}{acronym}{full name}
```

Then, the following three commands:

```
1 \glsxtrshort{label}
```

```
2 \glsxtrlong{label}
```

```
3 \glsxtrfull{label}
```

will print:

acronym

full name

acronym (full name)

in text, respectively. Example: `\glxtrshort{aluf}` → [ALUF](#)

- Define a symbol:

```
\glxtrnewsymbol[description={description text}]{label}{\ensuremath{the symbol}}
```

Then use `\gls{label}` to print the symbol. Example: `\gls{beta}` → β

0.3.8 Footnotes

Simply use the `\footnote{}` command where you want a footnote:

```
I need a footnote here\footnote{This is a footnote. Nothing else
.}.
```

I need a footnote here¹.

0.3.9 Bold, italics and underlined text

- **Bold text:**

```
\textbf{Bold text}
```

- *Italics text:*

```
\textit{Italics text}
```

- Underlined text:

```
\underline{Underlined text}
```

0.3.10 Other font styles (rarely used)

- Teletype font (usually used for displaying code):

```
\texttt{Teletype font}
```

- Sans Serif font:

```
\textsf{Sans Serif font}
```

¹This is a footnote. Nothing else.

- *Slanted font*:

```
1 \textsl{Slanted font}
```

If you would like to set a specific font for a section of text, it would be better to define a new command. In `0_Preamble/fonts.tex`, I define a `\myfont` command to set the *Arial* font for the title page. You may define another one using the similar commands. See [this](#) for more guidance.

0.3.11 Font sizes

Below are 10 default font size commands and their corresponding points font sizes (The standard points font size of this template is **12pt**)

Command	Font size (in pt)
<code>\tiny</code>	6
<code>\scriptsize</code>	8
<code>\footnotesize</code>	10
<code>\small</code>	10.95
<code>\normalsize</code>	12
<code>\large</code>	14.4
<code>\Large</code>	17.28
<code>\LARGE</code>	20.74
<code>\huge</code>	24.88
<code>\Huge</code>	24.88

All are used by enclosing the command and the selected text in the bracket, e.g.:

```
1 This is {\scriptsize not big} at all.
```

This is not big at all.

Note that one will barely change font sizes frequently in formal documents. I changed only when inserting tables in the appendices.


0.3.12 Text colors (rarely used)

1. **Colors need to be defined before you can use them.** You can either use the colors pre-defined in `xcolor` package, or define your custom colors. I have defined some university colors in this document as examples, you can modify them and define your own colors in `0_Preamble/colors.tex`.

- *Pre-defined colors*: See Chapter 4 of the [xcolor package documentation](#)

- *Custom color examples - colors of the University:*

UniPink: 

UniBrown: 

UniYellow: 

UniGreen: 

- *Custom color examples - colors of the University (legacy):*

UniRed: 

UniBlue: 

UniGrey: 

2. **Change the text color** by using `\color{}` command and a *color name*:

```
\ This is printed in {\color{UniGreen} UniGreen} color.
```

This is printed in UniGreen color.

3. **Change the background color** by using `\colorbox{ }{ }` command and a *color name*:

```
\ This is printed in \colorbox{UniGreen}{UniGreen} color.
```

This is printed in UniGreen color.

4. **Or both:**

```
\ This is printed in \colorbox{UniRed}{\color{White} UniRed}
color.
```

This is printed in UniRed color.

0.3.13 Listing

The most common list commands are `itemize` (unnumbered) and `enumerate` (numbered).

Both of them can be nested. For `itemize`, the symbols at different levels are big dots, dashes, asterisks, dots, etc.. For `enumerate`, the symbols are Arabic, Alphabetic, Roman, capital Alphabetic, etc..

To use, create an environment with `\begin{...}` and `\end{...}` command pair. For each item within, add `\item` at the beginning. All paragraphs below an item will be indented automatically.

Here are their examples:

```

1 \begin{itemize}
2     \item First level item
3     \item First level item
4     \begin{itemize}
5         \item Second level item \par
6         You can put as many paragraphs as you wish below
7         an item.
8         \item Second level item
9         \begin{itemize}
10             \item Third level item
11             \begin{itemize}
12                 \item Fourth level item
13             \end{itemize}
14             \item Third level item
15         \end{itemize}
16     \end{itemize}

```

- First level item
- First level item
 - Second level item

You can put as many paragraphs as you wish below an item.
 - Second level item
 - * Third level item
 - Fourth level item
 - * Third level item

```

1 \begin{enumerate}
2     \item First level item
3     \item First level item
4     \begin{enumerate}
5         \item Second level item \par
6         You can put as many paragraphs as you wish below
7         an item.
8         \item Second level item
9         \begin{enumerate}
10             \item Third level item
11             \begin{enumerate}
12                 \item Fourth level item
13             \end{enumerate}
14         \end{enumerate}
15     \end{enumerate}

```

```

13         \item Third level item
14     \end{enumerate}
15 \end{enumerate}
16 \end{enumerate}

```

1. First level item

2. First level item

a) Second level item

You can put as many paragraphs as you wish below an item.

b) Second level item

i. Third level item

A. Fourth level item

ii. Third level item

0.3.14 Insert an image

Before inserting any image — for the optimal appearance, and to demonstrate professionalism, I recommend you to *always* use *vector* instead of *raster* images in the thesis.

If you do not know what they are, you just need to know that when you zoom in on any *raster* image, you start to see the pixels, and the image gets blurred at its edge. Any screenshots, photos, and most pictures downloaded online are raster images. All images I use below are, on the contrary, *vectors*, so no matter how much you zoom in, the image quality remains unchanged.

Another way to distinguish raster images is to look at their filename extensions. JPG, PNG, WEBP are the most common extensions for raster images.

The best format of vector images for L^AT_EX is *.pdf*. Fortunately, many commonly used software support the export of image as the PDF vector format, including Stata, Origin, ArcMap, etc.. If you can only export to other vector graphics formats (e.g., *.svg/.dwg/.cdr*), sites such as [Convertio](#) can easily convert them to PDF.

- **Basic approach with the `\includegraphics[]{}{}` command:**

```

1 \includegraphics[width = 0.25\textwidth]{Graphics/
   UniFreiburgLogos/Classic.pdf}

```



In the command, the latter part in the bracket is the relative path to the image file, while `[width = 0.25\textwidth]` is the option to control the image width. But since I do not set the height at the same time, this option actually controls the image scaling. Apart from using the default \LaTeX length, it is possible to set the width and height with various units of length (cm, pt, in, etc.).

You can also specify the scaling with the `scale` option directly:

```
1 \includegraphics[scale = 1.2]{Graphics/UniFreiburgLogos/
   Classic.pdf}
```



And there are other options like `angle` that you can dig into.

- **Position and caption the image with the `figure` environment:**

Usually when inserting an image, you would nest the above command in the `figure` environment because it allows for positioning the image nicely in the page with a caption. Here is an example:

```
1 \begin{figure}[htbp]
2     \centering
3     \includegraphics[width = 0.25\textwidth]{Graphics/
   UniFreiburgLogos/Classic.pdf}
4     \caption{Uni Logo (Legacy)}
5     \label{docfig:UniLogoClassic}
6 \end{figure}
```

The `[htbp]` option forces the image to stay closer to where they declare in the content, while maintaining the layout of other elements. The `\centering`



FIGURE 1. UNI LOGO (LEGACY)

command centers all elements within the environment. `\caption{}` sets the caption “Figure X: ...” displayed below the image, and `\label{}` is for cross-referencing.

This way of inserting images should be much more common when writing. You would only insert an image without `figure` environment when you just want the image to be there, and nothing else, for example the university logo in the title page.

See [this](#) for more detailed guidance regarding the image positioning.

- **Sub-figures:**

When there are several images illustrating the same subject, you may use the `subfigure` environment nested in the `figure` environment:

```

1 \begin{figure}[htbp]
2   \centering
3   \begin{subfigure}[h]{0.4\textwidth}
4     \centering
5     \includegraphics[width = \textwidth]{
Graphics/UniFreiburgLogos/Classic.pdf}
6     \caption{The Old}
7     \label{docfig:SubFigClassic}
8   \end{subfigure}
9   \hfill
10  \begin{subfigure}[h]{0.4\textwidth}
11    \centering
12    \includegraphics[width = \textwidth]{
Graphics/UniFreiburgLogos/New.pdf}
13    \caption{The New}
14    \label{docfig:SubFigNew}
15  \end{subfigure}
16  \caption{Uni Logos}
17  \label{docfig:SubFig}

```

```
18 \end{figure}
```

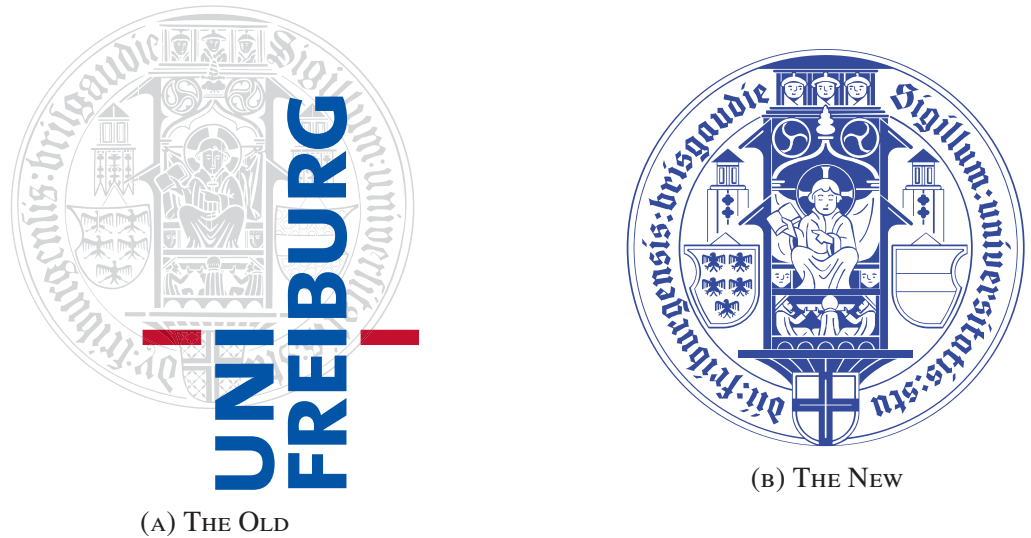


FIGURE 2. UNI LOGOS

Both images belong to [Figure 2](#), while each of them can be independently referenced as well: [Figure 2a](#) and [Figure 2b](#), as long as they are labeled.

Note that the scaling of a sub-figure is determined jointly by the `\includegraphics` option and the environment option, i.e. `{0.4\textwidth}` in this particular example. The `\hfill` command fills the appropriate horizontal space between the two sub-figures so that the figure as a whole occupies the full width of the page.

0.3.15 Align text

In some cases, you may want to precisely align multiple lines of text in some form. Suppose you are working on a collaborated paper and there is a page where you should mention all authors' names, matriculation numbers, and profiles.

You can simply list all the information like this:

```
1 \underline{Author Information}\par
2 Michael Jackson: 1234567, M. Sc. Betriebswirtschaftslehre\par
3 Audrey Hepburn: 7654321, M. Sc. Economics\par
4 Marie Curie: 1122334, M. Sc. Volkswirtschaftslehre\par
```

Author Information

Michael Jackson: 1234567, M. Sc. Betriebswirtschaftslehre

Audrey Hepburn: 7654321, M. Sc. Economics

Marie Curie: 1122334, M. Sc. Volkswirtschaftslehre

Or you can align the text for a neater layout:

```

1 \begin{tabular}{ll}
2   \underline{Author Information}\\
3   Michael Jackson: & 1234567, M. Sc.
4   Betriebswirtschaftslehre\\
5   Audrey Hepburn: & 7654321, M. Sc. Economics\\
6   Marie Curie: & 1122334, M. Sc. Volkswirtschaftslehre
7 \end{tabular}\par

```

Author Information

Michael Jackson: 1234567, M. Sc. Betriebswirtschaftslehre

Audrey Hepburn: 7654321, M. Sc. Economics

Marie Curie: 1122334, M. Sc. Volkswirtschaftslehre

This is done by using the `tabular` environment, which basically generates a *table without borders*. The columns of a table are perfect for aligning text.

The structure of a typical `tabular` table is as follows:

```

1 \begin{tabular}{lll}
2   ... & & \\
3   ... & & \\
4 \end{tabular}\par

```

where the `{lll}` `tabular` option specifies the number of columns (three letters) and how they are aligned (**l**(eft), **r**(ight), **c**(entered)). In this case, it means the table consists of three left-aligned columns.

Within the environment, the columns of the table are separated by ampersands ‘&’, while the rows are separated by double backslashes ‘\\’. For each row, the number of elements should not be larger than the number of columns defined.

The line breaking after `\end{tabular}` is always necessary, or \LaTeX will arrange the subsequent text in a weird way.

There are many cases where you may use `tabular` for text alignment. Take the previous example, but now you think **aligning all colons** would be more elegant:

```

1 \begin{tabular}{rl}
2   \underline{Author Information}\\
3   Michael Jackson: & 1234567, M. Sc.
4   Betriebswirtschaftslehre\\
5   Audrey Hepburn: & 7654321, M. Sc. Economics\\
6   Marie Curie: & 1122334, M. Sc. Volkswirtschaftslehre
7 \end{tabular}\par

```

Author Information

Michael Jackson: 1234567, M. Sc. Betriebswirtschaftslehre

Audrey Hepburn: 7654321, M. Sc. Economics

Marie Curie: 1122334, M. Sc. Volkswirtschaftslehre

You can see the alignment is perfect and modifying one letter in the tabular option is all you need. Doing this on MS Word could be much more frustrating with many spaces to add and adjust.

0.3.16 Insert a table

Inserting a table is somewhat similar to inserting an image. As mentioned, the tabular environment generates tables without borders. To format, position and label, now nest it in the table environment:

```

1 \begin{table}[htbp]
2   \centering
3   \caption{Your Caption Here}
4   \begin{tabular*}{\textwidth}{1 @{\extracolsep{\fill}}
ccc}
5       \toprule
6       \toprule
7       & (1) & & (2) & & (3) & \\
8       \midrule
9       & & & & & & \\
10      ..... & & & & & & \\
11      ..... & ... & & ... & & ... & \\
12      & (...) & & (...) & & (...) & \\
13      ..... & ... & & ... & & ... & \\
14      & & & & & & \\
15      \midrule
16      ..... & ... & & ... & & ... & \\
17      ..... & & & & & & \\
18      \bottomrule
19      Some short notes here\\
20      Need to manually \\
21      \end{tabular*}
22      \label{Your Label Here}
23 \end{table}

```

Above is a basic structure you can use to insert a table. I use the enhanced tabular* environment to allow for more parameters:

```

1 \begin{tabular*}{\textwidth}{1 @{\extracolsep{\fill}} ccc...}
2   ...
3 \end{tabular*}

```

where `\textwidth` makes the table fill the entire text width, and `{1 @\extracolsep{\fill}} ccc` declares four columns while filling in appropriate space between the first and second column. `\toprule`, `\midrule` and `\bottomrule` are commands for the formal horizontal borders.

Here is an example of how the table looks like with this structure: [Table 1](#). The main disadvantage of the `table` environment is that it performs bad when you need to write a long note beneath the table because it does not automatically break lines.

TABLE 1. BASELINE RESULTS

	(1)	(2)	(3)
Dependent Var			
Var1	-0.00438 (0.00351)	-0.00505 (0.00354)	-0.00535 (0.00355)
Var2		0.202* (0.114)	0.233** (0.115)
Var3			0.393*** (0.126)
Constant	0.0200 (0.163)	-0.00365 (0.164)	-0.0764 (0.166)
Observation	643	643	643
R^2			

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Therefore, I nest the `threeparttable` environment very often when writing my thesis. The structure is similar:

```

1      \begin{table}[htbp]
2          \centering
3          \begin{threeparttable}
4              \caption{Your Caption Here}
5              \label{Your Label Here}
6              \begin{tabular*}{\textwidth}{1 @{\extracolsep{\fill}} ccc}
7                  \toprule
8                  \toprule
9                  & (1) & (2) & (3) & \\
10                 \midrule
11                 & & & & \\

```

```

12 ..... & & & \\
13 ..... & ... & ... & ... \\
14 & (...) & (...) & (...) \\
15 ..... & ... & ... & ... \\
16 & & & \\
17 \midrule
18 ..... & ... & ... & ... \\
19 ..... & & & \\
20 \bottomrule
21 \end{tabular*}
22 \begin{tablenotes}
23 \scriptsize
24 \item \emph{Notes}: Some short
or long notes here
25 \end{tablenotes}
26 \end{threeparttable}
27 \end{table}

```

Pay attention to where the `threeparttable` and the `tablenotes` environment are inserted. The table looks like: [Table 2](#).

TABLE 2. BASELINE RESULTS			
	(1)	(2)	(3)
Dependent Var			
Var1	-0.00438 (0.00351)	-0.00505 (0.00354)	-0.00535 (0.00355)
Var2		0.202* (0.114)	0.233** (0.115)
Var3			0.393*** (0.126)
Constant	0.0200 (0.163)	-0.00365 (0.164)	-0.0764 (0.166)
Observation	643	643	643
R^2			

Notes: Some short or long notes here. Some short or long notes here. Some short or long notes here. Some short or long notes here. Some short or long notes here.

Sometimes when the table is too wide, it would be better to nest the whole structure in the `pdfscape` environment:

```

1 \begin{pdfscape}
2   \begin{table}

```

```

3           \centering
4           \begin{threeparttable}
5               ...
6           \end{threeparttable}
7       \end{table}
8 \end{pdflscape}

```

It rotates the whole page to landscape for the table to print properly.

You can always copy paste the above structure whenever creating a table, simply changing the number of columns and the content inside the `tabular*` environment. If the raw data you have is in `.csv` or `.xlsx` format, you can easily convert it into \LaTeX commands using the [Excel2 \$\text{\LaTeX}\$](#) add-in for MS Office Excel, or the [online convert tools](#).

See [this](#) for more tutorials regarding tables.

0.3.17 For inserting equations

There are some very useful website for writing \LaTeX markup equations, without having to remember commands:

- [LaTeXLive / Equation Editor](#): writing and previewing equations
- [Mathcha](#): even stronger editor with OCR and numerous choice of mathematical symbols
- [Mathpix](#): OCR to convert equations in photos and images to \LaTeX commands

Below is the introduction to some examples with common structures.

- Normal equation (`\quad` for spacing the equation and the constraint):

```

1 \begin{equation}
2     u'(c_{\{t\}}) = \beta R u'(c_{\{t+1\}}), \quad t = 0, 1, 2,
3     \cdots
4 \end{equation}

```

$$u'(c_t) = \beta R u'(c_{t+1}), \quad t = 0, 1, 2, \dots \quad (1)$$

- Unnumbered equation (`equation*` environment):

```

1 \begin{equation*}
2     u'(c_{\{t\}}) = \beta R u'(c_{\{t+1\}})
3 \end{equation*}

```

$$u'(c_t) = \beta R u'(c_{t+1})$$

- Aligned equations (align environment, add ‘&’ before ‘=’ to align equations with equal signs and use ‘\\’ to break different equations):

```

1 \begin{align}
2     u'(c_{\{t\}}) &= \beta R u'(c_{\{t+1\}}) \\
3     R &= \frac{u'(c_{\{t\}})}{\beta u'(c_{\{t+1\}})} \label{doceqn:Returns}
4 \end{align}

```

$$u'(c_t) = \beta R u'(c_{t+1}) \quad (2)$$

$$R = \frac{u'(c_t)}{\beta u'(c_{t+1})} \quad (3)$$

- Unnumbered aligned equations:

```

1 \begin{align*}
2     u'(c_{\{t\}}) &= \beta R u'(c_{\{t+1\}}) \\
3     R &= \frac{u'(c_{\{t\}})}{\beta u'(c_{\{t+1\}})}
4 \end{align*}

```

$$u'(c_t) = \beta R u'(c_{t+1})$$

$$R = \frac{u'(c_t)}{\beta u'(c_{t+1})}$$

- Selectively numbered equations (add \nonumber between an equation and the ‘\\’ line breaking if you do not want it to be numbered):

```

1 \begin{align}
2     u'(c_{\{t\}}) &= \beta R u'(c_{\{t+1\}}) \nonumber \\
3     R &= \frac{u'(c_{\{t\}})}{\beta u'(c_{\{t+1\}})}
4 \end{align}

```

$$u'(c_t) = \beta R u'(c_{t+1})$$

$$R = \frac{u'(c_t)}{\beta u'(c_{t+1})} \quad (4)$$

- Sub-numbering equations (subequations environment):

```

1 \begin{subequations}
2     \begin{align}

```

```

3          u'(c_{t}) &= \beta R u'(c_{t+1}) \label{
doceqn:Euler2} \\
4          Q u'(c_{t}) &= Q \beta R u'(c_{t+1}) \\
5          R &= \frac{u'(c_{t})}{\beta u'(c_{t+1})} \\
6      \end{align}
7 \end{subequations}

```

$$u'(c_t) = \beta R u'(c_{t+1}) \quad (5a)$$

$$Q u'(c_t) = Q \beta R u'(c_{t+1}) \quad (5b)$$

$$R = \frac{u'(c_t)}{\beta u'(c_{t+1})} \quad (5c)$$

- Adding symbols or references above or below signs (`\overset{...}{...}`/`\underset{...}{...}` commands):

```

1 \begin{align*}
2     u'(c_{t}) &= \beta R u'(c_{t+1}) \\
3     R &\underset{\eqref{doceqn:Euler2}}{=} \frac{u'(c_{t})}{\beta u'(c_{t+1})} \\
4     l_{t}^s &\overset{!}{=} l_{t}^d \\
5 \end{align*}

```

$$u'(c_t) = \beta R u'(c_{t+1})$$

$$R \underset{(5a)}{=} \frac{u'(c_t)}{\beta u'(c_{t+1})}$$

$$l_t^s \overset{!}{=} l_t^d$$

0.3.18 For hyperlinks, referencing and citations

- **Hyperlinks**

There are mainly 2 ways to use hyperlinks:

```
1 \url{https://master.econ.uni-freiburg.de/}
```

<https://master.econ.uni-freiburg.de/>

```
1 \href{https://master.econ.uni-freiburg.de/}{Your Text Here}
```

[Your Text Here](https://master.econ.uni-freiburg.de/)

- **Referencing**

A chapter/section/subsection/figure/table/equation can be referenced only if it has been *labeled*. Use the `\label{}` command to do this after defining any of the above.

When referencing, simply use `\Cref{}` (note the capitalized C) and put the label name in the command bracket:

```
\Cref{chap:Intro}
```

See [Chapter 1](#)

```
\Cref{docsec:setup}
```

See [Section 0.2](#)

```
\Cref{doceqn:Euler}
```

See [Equation \(1\)](#)

```
\Cref{docfig:UniLogoClassic}
```

See [Figure 1](#)

```
\Cref{doctab:test}
```

See [Table 1](#)

For referencing equations and figures, you can also use `\cref{}` for abbreviations:

```
\cref{doceqn:Euler} and see \cref{docfig:UniLogoClassic}
```

See [Eq. \(1\)](#) and see [Fig. 1](#)

Note: formally, abbreviations should not be used at the beginning of a sentence.

When referencing several equations at the same time, the text ‘Equation’ may seem redundant. In this case, `\eqref{}` is more useful:

```
Combining \Cref{doceqn:Euler} and \eqref{doceqn:Euler2}
then plugging them into \eqref{doceqn>Returns} yields
...
```

Combining [Equation \(1\)](#) and [\(5a\)](#) then plugging them into [\(3\)](#) yields...

• Citations

Not needing additional reference management software to cite is one of the biggest advantages of writing with \LaTeX . You can cite articles easily

by using the `\textcite{}` / `\parencite{}` commands with the `BIBTEX` file you build. What needs to be put into the command bracket is the *citekey* of a literature, which is the *first element* of a `BIBTEX` entry.

In this template, the default `BIBTEX` file: **BibFile.bib** is located in the ‘**Bib**’ folder. I have stored some example citations for you to see how they look like in the bib file and in the bibliography.

Usually, the journal website should provide an option to download/export the citation of every article in `BIBTEX` format. For a published journal article, the typical structure of the citation entry is:

```

1 @article{ABC123456,
2     author = {Surname1, First Name1 and Surname2,
3       First Name2},
4     title  = {The Article Title},
5     journal = {The Journal Name},
6     volume = {volume number},
7     number = {issue number},
8     pages  = {page number range XX-XX},
9     year   = {year number},
10    month  = {month number},
11    doi     = {article DOI},
12    url     = {https://doi.org/[article DOI Here]},
13 }

```

where `@article` is the entry type and “ABC123456” is the first element (citekey) of the entry. If you want to cite it in the thesis, it would either be:

```
1 \textcite{ABC123456}
```

Surname1 and Surname2 (Year)

Or:

```
1 \parencite{ABC123456}
```

(Surname1 and Surname2, Year)

Below are several real citations as examples, note that `LATEX` provides citation hyperlinks to the corresponding articles in the bibliography.

```
1 \textcite{Chiriac2011} studied...
```

[Chiriac and Voev \(2011\)](#) studied...

```
1 ...remains static in the dynamics \parencite{Gaudin2017}.
```

...remains static in the dynamics ([Gaudin, 2017](#)).

```
1 \textcite{Hillebrand2019} developed...
```

Hillebrand and Hillebrand (2019) developed...

```
1 \textcite{Luetkebohmert2020} found...
```

Lütkebohmert and Sester (2020) found...

```
1 \textcite{Neumann2006} research utilized...
```

Neumann et al. (2006) utilized...

```
1 ...failed to find strong evidence \parencite{Schulze2003}.
```

...failed to find strong evidence (Schulze & Frank, 2003).

```
1 ...positive impacts on economic development \parencite{
  Isaksson2018, Isaksson2018a}.
```

...positive impacts on economic development (Isaksson & Kotsadam, 2018a; 2018b).

Important: it is vital to double-check how your entries display in the bibliography because sometimes the entries do not match the document settings. The most common problem for me is the DOI field, where *only the DOI number instead of the URL is needed*. If “https://doi.org/...” is put in the DOI field, the actual hyperlink in the bibliography will format wrongly.

Although you do not need a software just for citations in text, it is still convenient to manage all your entries using software like [JabRef](#). It sorts entries nicely and provides numerous practical functions.

[BibTeX.eu](#) introduces all 14 entry types in BibTeX. If there is no official way for you to download the entries, you have to choose the most appropriate one from these types and enter the fields manually. For instance, working papers often do not have citations in BibTeX format, while the best type for them should be @techreport.

0.3.19 Declare an Assumption / Hypothesis / Theorem

I define these three environments in **math.tex** that you can use directly. They are all used in exactly the same way, all you need is to modify the corresponding environment name depending on what you want to define.

```
1 \begin{hypothesis}
2   This is a hypothesis.
3 \end{hypothesis}
```

Hypothesis 1. *This is a hypothesis.*

```

1 \begin{subtheorems}{theorem}
2     \begin{theorem}
3         This is a sub-theorem.
4     \end{theorem}
5     \begin{theorem}
6         This is another sub-theorem.
7     \end{theorem}
8 \end{subtheorems}

```

Theorem 1.A. *This is a sub-theorem.*

Theorem 1.B. *This is another sub-theorem.*

```

1 \begin{subassumptions}{assumption}
2     \begin{assumption}
3         The structure is the same. Simply change the
4         environment name works.
5     \end{assumption}
6     \begin{assumption}
7         assumption(s), theorem(s), hypothesis/hypotheses
8     \end{assumption}
9 \end{subassumptions}

```

Assumption 1.A. *The structure is the same. Simply change the environment name works.*

Assumption 1.B. *assumption(s), theorem(s), hypothesis/hypotheses*

0.4 Some Last Remarks

- [Overleaf](#) provides a more detailed documentation for new \LaTeX users to get start on.
- [CTAN](#) and [Stack Exchange](#) are two useful websites if you want to understand all the packages and commands in detail. You can download the package documentations/manuals in the former and find answers to specific questions in the latter.
- [Here](#) is an article by [Brittman \(2007\)](#) which summarized some common (bad) habits of Chinese students when writing English academic essays.

- Here is another booklet by the *EconBiz* team on how to write the best paper: [the English version](#) or [the original German version](#)
- In case you have further questions about the template, feel free to drop me an email at zhiyuan.qiu@outlook.com or open an issue on my [GitHub repository](#).

Good Luck!

1 Introduction

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Nulla malesuada porttitor diam. Donec felis erat, congue non, volutpat at, tincidunt tristique, libero. Vivamus viverra fermentum felis. Donec nonummy pellentesque ante. Phasellus adipiscing semper elit. Proin fermentum massa ac quam. Sed diam turpis, molestie vitae, placerat a, molestie nec, leo. Maecenas lacinia. Nam ipsum ligula, eleifend at, accumsan nec, suscipit a, ipsum. Morbi blandit ligula feugiat magna. Nunc eleifend consequat lorem. Sed lacinia nulla vitae enim. Pellentesque tincidunt purus vel magna. Integer non enim. Praesent euismod nunc eu purus. Donec bibendum quam in tellus. Nullam cursus pulvinar lectus. Donec et mi. Nam vulputate metus eu enim. Vestibulum pellentesque felis eu massa.

2 Background

2.1 Section 2.1

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

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2.2 Section 2.2

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ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

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2.3 Section 2.3

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3 Something Interesting

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3.1 Section 3.1

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5 Discussion

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Appendices

Appendix A: Tables

Appendix B: Figures

Certification

I certify that the thesis at hand was made without unauthorized help and that I only used the tools denoted. All statements literally or logically taken from publications are marked as quotes.

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Signature