University of Duisburg-Essen
Faculty of Business Administration and Economics
Chair of Econometrics

The Title of Your Seminar Paper

Course

Term Paper

Submitted to the Faculty of
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at the
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from:

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Semester:	5^{th}	4^{th}	3^{rd}
Graduation (est.):	Summer Term 2020	Summer Term 2020	Summer Term 2020

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1 Rmarkdown Template

Currently there is one thing you need to customise manually in *template.tex* which will be used by the LaTeXprocessor for generating the PDF: the entries in the columns on the title page containing student info. Here you have to replace the dummy data:

```
\begin{multicols}{$cols_authors$}

Name:

Matriculation No.:

E-Mail:

Study Path:

Semester:

Graduation (est.):
```

If you are just two people, working alone or want to remove the colum design you may delete (parts of) this section.

1.1 R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details see http://rmarkdown.rstudio.com.

You may use LaTeX to write formulas, e.g., $X^2 = \sqrt{X^4}$ and

$$X^2 = \sqrt{X^4}.$$

After clicking the *Knit* button in *RStudio*, a (PDF) document that includes both content and the output of any embedded R code chunks will be generated.

You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed           dist
##  Min.   : 4.0   Min.   :  2.00
##  1st Qu.:12.0   1st Qu.: 26.00
##  Median :15.0   Median : 36.00
##  Mean   :15.4   Mean   : 42.98
```

```
##  3rd Qu.:19.0   3rd Qu.: 56.00
##  Max.   :25.0   Max.   :120.00
```

1.2 Including Plots

You can also embed plots, for example:

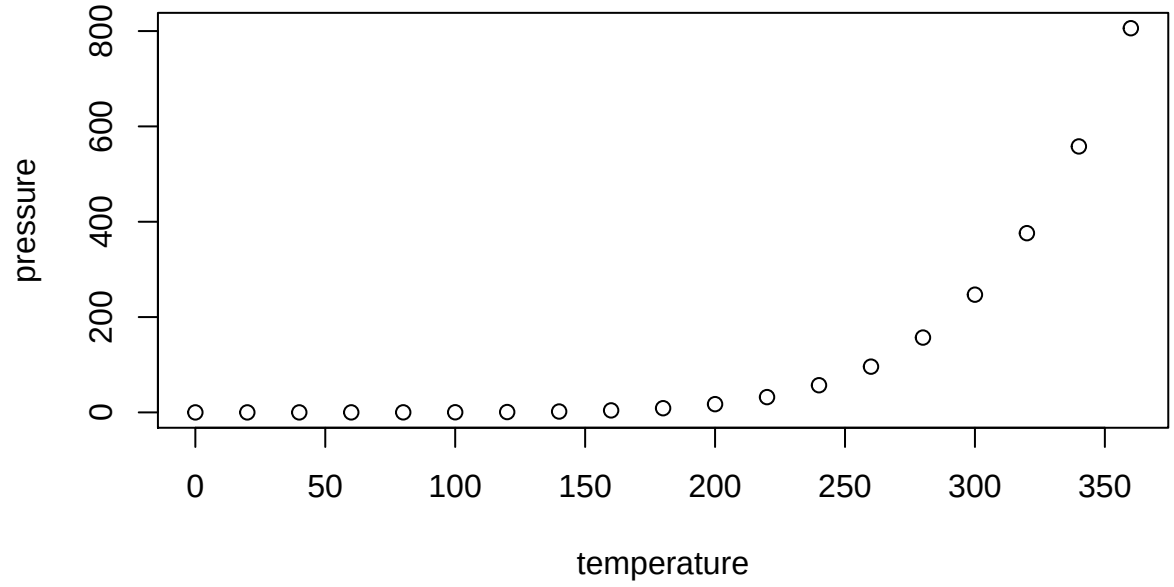

Figure 1: Pressure

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot. You can label the plot above by including the label `\\label{fig:pressure}` in the chunk argument `fig.cap`. A reference to the plot is then made as follows:

Looking at Figure 1 makes me happy.

1.3 The YAML Header

The YAML header is at the very top of this document. It is enclosed by 3 dashes. Although some useful options are specified already (most of which are hopefully self-explaining) you may want additional customisation. Below we discuss useful options that we have implemented for you.

*Note that **indentation and line breaks matter** in the YAML header.* More about that here.

1.3.1 `language`

This variable affects mainly the headings of your output file and automatic hyphenation.

You can set this to `english` or `german` like this:

```
language: english
```

`language: german`

If the language is not specified in the YAML header it will be set to `english`.

1.3.2 `linespread`

The default value for the linespread is 1.5. Usually this is fine and sometimes it's required. If you nevertheless want to change it you can do so by specifying the linespread variable, e.g.

`linespread: 1`

2 Rmarkdown makes your life easy

2.1 The kable function

In empirical work it's crucial not only to present your results but also to explain your research strategy. This often involves tables presenting data and results. Generating tables by hand using LaTeXis an option but may be time consuming. However, there is a variety of R packages that automate this. One of them is the `kable` package. It can generate LaTeXtables from a variety of R Objects.

Example: you are working on an analysis of black cherry trees and want to present n observations to the reader You can do that using `knitr::kable()`.

Table 1: 6 Observations from the trees Dataset

Diameter	Height	Volume
11.1	80	22.6
8.8	63	10.2
11.4	76	21.0
16.3	77	42.6
11.0	75	18.2
14.2	80	31.7

Now that we have presented our data it's analysis time! Lets start with a quick call to summary().

2.2 The Stargazer package

Calling summary() in a code chunk will work but this will give you quite an ugly result (just try it for yourself!). When it comes to presenting more structured objects like summaries, model results or for example correlation matrices the stargazer package is well suited.

Assume we want to evaluate how the height and the volume of a typical cherry tree are related. We are estimating this using OLS to estimate a simple linear model.

Table 2: Summary

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Girth	31	13.248	3.138	8.300	11.050	15.250	20.600
Height	31	76.000	6.372	63	72	80	87
Volume	31	30.171	16.438	10.200	19.400	37.300	77.000

Table 3: Regression results

	Dependent variable:
	Volume
Height	1.543^{***}
	(0.384)
Constant	-87.124^{***}
	(29.273)
Observations	31
R^2	0.358
Adjusted R^2	0.336
Residual Std. Error	13.397 (df = 29)
F Statistic	16.164^{***} (df = 1; 29)
Note:	*p<0.1; **p<0.05; ***p<0.01

Now that we have our model we can visualize it.

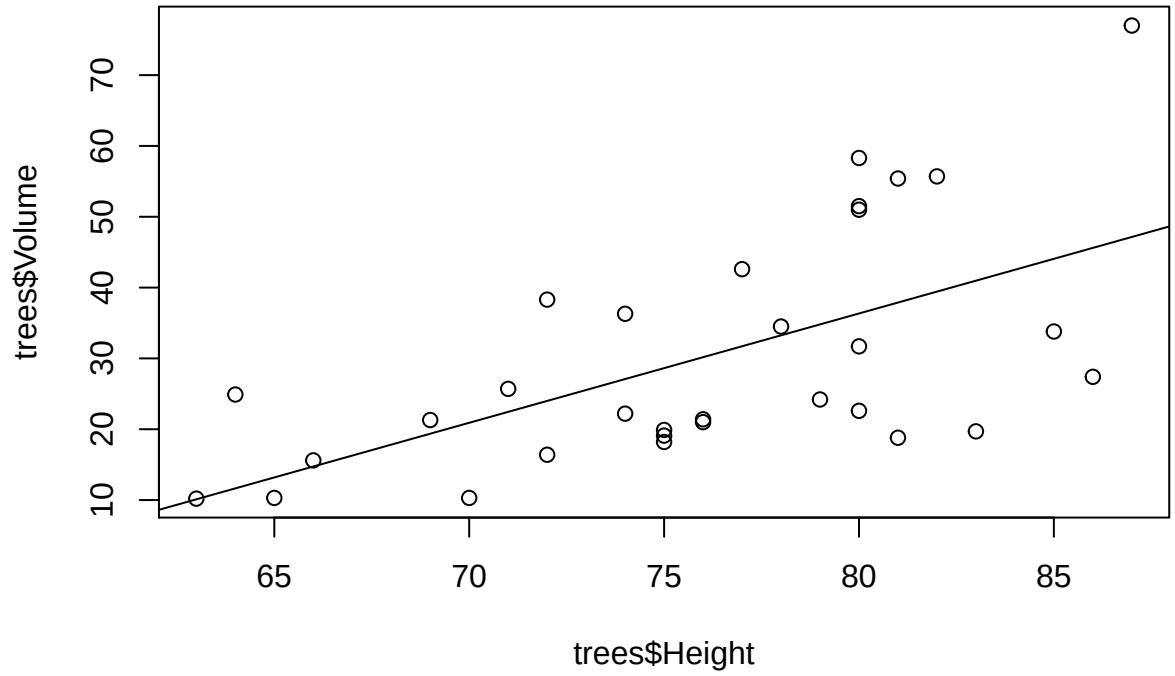

Figure 2: Dataset and regression

By the way: the (LaTeX) command `\pagebreak` can be used to force a page break.

2.3 Citations

A *bibtex* bibliography can be used for citations. The bibliography file used in this template is `references.bib` and you find it in the project directory. It is easily edited using *RStudio*

A simple *bibtex* entry looks like this:

```
@book{
  Hastie2013,
  publisher = {Springer},
  year = {2013},
  title = {The elements of statistical learning},
  author = {Hastie, Trevor and Tibshirani, Robert and Friedman, Jerome H.},
}
```

The first field (`Hastie2013`) is the identifier which allows you to cite a reference.

You can cite a source in Harvard style like this: (Hastie et al., 2013) or Hastie et al. (2013).

A cited source will be automatically added to the reference section at the end of the document.

3 Conclusion

Your conclusion. Note that you may also refer to a specific chapter or section in the document, provided there is a label. We have anchored a label to the section header of the Conclusion. You may reference it as follow: See Chapter 3.

This section allows you to reference R packages used in the analysis. Simply include them in `R_packages.bib` as *bibtex* entries and include the identifiers using `\notecite{...}` as shown below.

References

Hastie, T., Tibshirani, R., & Friedman, J. H. (2013). *The elements of statistical learning : Data mining, inference, and prediction* (2. ed., corr. at 7. print.). New York, NY, Springer. http://digitale-objekte.hbz-nrw.de/storage2/2015/11/27/file_5/6530880.pdf

Software-References

R Core Team. (2019). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. Vienna, Austria. https://www.R-project.org/

RStudio Team. (2019). *Rstudio: Integrated development environment for r* [Version 1.2.1541]. Version 1.2.1541. RStudio, Inc. Boston, MA. http://www.rstudio.com/

A Appendix

A.1 Description of relevant Variables

An example using the LaTeX environment *longtable*:

Table A1: Description of relevant variables

Variable	**Dataset**	**Description**
Student.Pseudonym	all	Student's immatriculation number
Semester	FS Data	Academic semester. The first four digits stand for the year, the fifth digit is either a 1 (summer semester) or a 2 (winter semester). Example: "20062" describes the winter semester 2006/2007, "20071" the summer semester 2007
FS	FS, Pruefung Data	Study semester
Status	FS Data	Status as a student. "R" stands for re-enrollment, "N" for new enrollment, "E" for initial enrollment and "B" for leave of absence
Status.dpp	Pruefung Data	See variable Status
Austrittsgrund	FS, Studium Data	Reason for dropping out
SGCode	all	Code for study program. The last digit represents the examination regulations (PO). A change to the PO is thus considered as a new program in the system
Abschluss_Bezeichnung	FS, Pruefung Data	Name of the degree that students receive upon successful completion of their studies
Fach_Bezeichnung	FS, Pruefung Data	Name of the course of studies
PO	all	Examination regulations
PolyvalentePruefungsnummer	Pruefung Data	Polyvalent examination number
Bezeichnung	Pruefung Data	Name of the examination
Pruefungssemester	Pruefung Data	Semester in which the student was registered for the exam. Structure analogous to the variable 'Semester' in FS Data

Continued on the next page.

Table A1: Description of relevant variables (continued)

Variable	**Dataset**	**Description**
Status.Pruefung	Pruefung Data	Status of the exam. "BE" means Passed, "ZU" means Withdrawn, "NB" means Not Passed and "PV" means Examination Existing (applications or performances are available, but the whole module is not yet completed)
Versuchszahl	Pruefung Data	Trial number
Note	Pruefung Data	Grade
VerbuchteECTSCP	Pruefung Data	Received ECTSCP
Start_Semester	Studium Data	Semester in which the studies were started. Structure analogous to the variable 'Semester' in FS Data
Ende_Semester	Studium Data	Semester in which the studies were finshed. Structure analogous to the variable 'Semester' in FS Data

End of table.