

Working with L^AT_EX in RMarkdown

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1 Introduction

This is an example file so that you might see how some things are accomplished in L^AT_EX

2 Tables

2.1 stargazer

The R function `stargazer` is best for comparing models, make sure you give it enough space on a page as it does not like page breaks.

```
library(stargazer)
stargazer(lm(iris$Sepal.Length ~ iris$Sepal.Width),
          lm(iris$Petal.Length ~ iris$Petal.Width), header = FALSE)
```

Table 1:

	<i>Dependent variable:</i>	
	Sepal.Length (1)	Petal.Length (2)
Sepal.Width	-0.223 (0.155)	
Petal.Width		2.230*** (0.051)
Constant	6.526*** (0.479)	1.084*** (0.073)
Observations	150	150
R ²	0.014	0.927
Adjusted R ²	0.007	0.927
Residual Std. Error (df = 148)	0.825	0.478
F Statistic (df = 1; 148)	2.074	1,882.452***

Note: *p<0.1; **p<0.05; ***p<0.01

2.2 pander

The R function `pander` prints nicely and allows page breaks within a table.

```
library(pander)
panderOptions('table.split.table', Inf)
set.caption("Data on cars")
pander(mtcars[1:12,1:7], style = 'rmarkdown')
```

Table 2: Data on cars

	mpg	cyl	disp	hp	drat	wt	qsec
Mazda RX4	21	6	160	110	3.9	2.62	16.46
Mazda RX4 Wag	21	6	160	110	3.9	2.875	17.02
Datsun 710	22.8	4	108	93	3.85	2.32	18.61
Hornet 4 Drive	21.4	6	258	110	3.08	3.215	19.44
Hornet Sportabout	18.7	8	360	175	3.15	3.44	17.02
Valiant	18.1	6	225	105	2.76	3.46	20.22
Duster 360	14.3	8	360	245	3.21	3.57	15.84
Merc 240D	24.4	4	146.7	62	3.69	3.19	20

	mpg	cyl	disp	hp	drat	wt	qsec
Merc 230	22.8	4	140.8	95	3.92	3.15	22.9
Merc 280	19.2	6	167.6	123	3.92	3.44	18.3
Merc 280C	17.8	6	167.6	123	3.92	3.44	18.9
Merc 450SE	16.4	8	275.8	180	3.07	4.07	17.4

2.3 xtable

The R function `xtable` generates \LaTeX code, so the chunk option `results = 'asis'` will render it correctly:

```
library(xtable)
options(xtable.comment = FALSE)
data(tli)
xtable(tli[1:10, ])
```

	grade	sex	disadv	ethnicity	timth
1	6	M	YES	HISPANIC	43
2	7	M	NO	BLACK	88
3	5	F	YES	HISPANIC	34
4	3	M	YES	HISPANIC	65
5	8	M	YES	WHITE	75
6	5	M	NO	BLACK	74
7	8	F	YES	HISPANIC	72
8	4	M	YES	BLACK	79
9	6	M	NO	WHITE	88
10	7	M	YES	HISPANIC	87

2.4 Advanced tables

You would need \LaTeX skills for all of these. This is strictly about table construction (usually with text or a mix, not matrices or output from functions.) The tabular environment (there are others) are good for this. Important parts are the table structure specification, the ampersand & separator and the double slash (line break)

A	1	☹
B	2	☹
C	3	♥

By adding more specifications to the structure, we have a different appearance

A	1	☹
B	2	☹
C	3	♥

Adding a horizontal line gives it a little more polish

A	1	☹
B	2	☹
C	3	♥

A	1	☹
B	2	☹
C	3	♥

If you have a lot of text use the `p` specification for a table:

Number	Units	Description
101A	4	(Formerly numbered 101B.) Lecture, three hours; discussion, one hour. Enforced requisite: course 10 or 12 or 13. Recommended: course 102A. Applied regression analysis, with emphasis on general linear model (e.g., multiple regression) and generalized linear model (e.g., logistic regression). Special attention to modern extensions of regression, including regression diagnostics, graphical procedures, and bootstrapping for statistical influence. P/NP or letter grading.
101B	4	(Formerly numbered 101A.) Lecture, three hours; discussion, one hour. Enforced requisite: course 101A. Fundamentals of collecting data, including components of experiments, randomization and blocking, completely randomized design and ANOVA, multiple comparisons, power and sample size, and block designs. P/NP or letter grading.

multicolumn allows a row to span multiple columns, here, the name of the department is spanning 3 columns and is being centered:

UCLA Department of Statistics		
Number	Units	Description
101A	4	(Formerly numbered 101B.) Lecture, three hours; discussion, one hour. Enforced requisite: course 10 or 12 or 13. Recommended: course 102A. Applied regression analysis, with emphasis on general linear model (e.g., multiple regression) and generalized linear model (e.g., logistic regression). Special attention to modern extensions of regression, including regression diagnostics, graphical procedures, and bootstrapping for statistical influence. P/NP or letter grading.
101B	4	(Formerly numbered 101A.) Lecture, three hours; discussion, one hour. Enforced requisite: course 101A. Fundamentals of collecting data, including components of experiments, randomization and blocking, completely randomized design and ANOVA, multiple comparisons, power and sample size, and block designs. P/NP or letter grading.

The multirow package (not shown) allows a column to span multiple rows.

3 Equation Fundamentals in L^AT_EX

Equations, use a double dollar sign to bracket them (non-preferred style) OR use a slash with open and close square brackets (preferred style) OR a begin and end equation

3.1 Using a slash with open and close square brackets

$$\exp(i\theta) = \cos \theta + i \sin \theta, \quad \sinh(\log x) = \frac{1}{2} \left(x - \frac{1}{x} \right).$$

3.2 Using a double dollar sign (not recommended)

$$\lim_{q \rightarrow \infty} \|f(x)\|_q = \max_x |f(x)|,$$

3.3 Using an equation environment (generates numbering)

$$\begin{array}{cccccc}
 -2 & 1 & 0 & 0 & \cdots & 0 \\
 1 & -2 & 1 & 0 & \cdots & 0 \\
 0 & 1 & -2 & 1 & \cdots & 0 \\
 0 & 0 & 1 & -2 & \ddots & \vdots \\
 \vdots & \vdots & \vdots & \ddots & \ddots & 1 \\
 0 & 0 & 0 & \cdots & 1 & -2
 \end{array} \tag{1}$$

3.4 Equation arrays (the asterisk supresses numbering)

$$u_{\alpha} = \epsilon^2 \kappa_{xxx} \left(y - \frac{1}{2} y^2 \right), \tag{2}$$

$$v = \epsilon^3 \kappa_{xxx} y, \tag{3}$$

$$p = \epsilon \kappa_{xx}. \tag{4}$$

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} \quad \text{where } n! = \prod_{i=1}^n i,$$

$$\overline{U_{\alpha}} = \bigcap_{\alpha} U_{\alpha}.$$

4 Graphics in RMarkdown with \LaTeX

4.1 The package `graphicx`

The package `graphicx` is used for importing and manipulating external graphics files. This is different from generating R graphics using the “chunks”:

```
library(ggplot2)
ggplot(data=diamonds, aes(x=carat, y=price, colour=clarity)) + geom_point(alpha=0.1) +
  geom_smooth() + theme_classic()
```

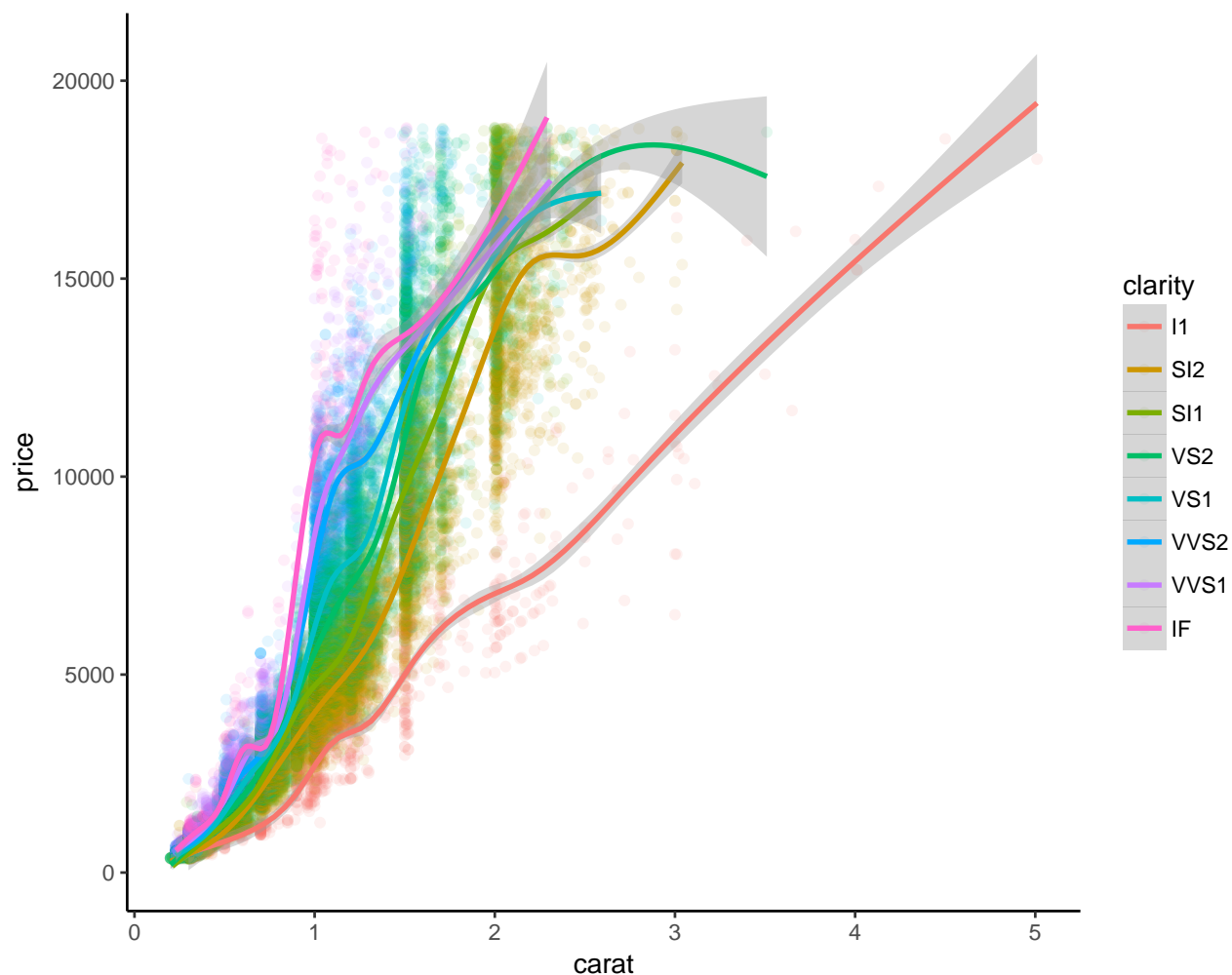


Figure 1: Scatter with GAM smoother

We control the size of R graphics with chunk options such as `fig.height` and `fig.width`. We use the option `fig.cap=` to generate captions. But what about an external graphic mixed with text? This is easily accomplished using \LaTeX and two packages (`graphicx` and `overpic`):

4.2 Using includegraphics



Here, we turn and shrink:



If you want to add a caption, you'll need to nest your graphic in a figure environment:

Figure 2: The University Seal.



5 L^AT_EX unrelated to document content (but necessary)

5.1 The geometry package

Use this package to control the page layout, if you look at the header, I am choosing one inch margins on the left and right, and approximately one inch on the top and bottom (but controlling the space allocation of the header and footer). The geometry package can be used for paper orientation and paper size too (e.g., legal, A4, custom size). The options headheight, headsep, footskip are only needed if one is using headers (as in this document, see the information on the fancyhdr package)

5.2 The fancyhdr package

The package fancyhdr allows control of the header and footer completely. This makes it possible for users to perform tasks such as inserting page numbers and adding dynamic dates. The header will contain the header and footer structure.

6 Using Color with the xcolor package

The xcolor package allows driver independent access to several kinds of color tints, shades, tones, and color mixing. It should be in the header.

An example of the application of color in text:

*And He said to them, “**Cast the net on the right-hand side of the boat and you will find a catch.**”, So they cast, and then they were not able to haul it in because of the great number of fish.*

6.1 The basic colors

Just call them by name at the appropriate place:

black, blue, brown, cyan, darkgray, gray, green, lightgray, lime, magenta, olive, orange, pink, purple, red, teal, violet, white, yellow

6.2 The 68 dvips colors

dvips is a computer program that converts the Device Independent file format (DVI) output of L^AT_EX into printable or presentable form. A list of recognized dvips colors:

Apricot Aquamarine } Bittersweet
 Black Blue BlueGreen
 BlueViolet BrickRed Brown
 BurntOrange CadetBlue CarnationPink
 Cerulean CornflowerBlue Cyan
 Dandelion DarkOrchid Emerald
 ForestGreen Fuchsia Goldenrod
 Gray Green GreenYellow
 JungleGreen Lavender LimeGreen
 Magenta Mahogany Maroon
 MelonMidnightBlue Mulberry
 NavyBlue OliveGreen Orange

OrangeRed Orchid Peach
 Periwinkle PineGreen Plum
 ProcessBlue Purple RawSienna
 Red RedOrange RedViolet
 Rhodamine RoyalBlue RoyalPurple
 RubineRed Salmon SeaGreen
 Sepia SkyBlue SpringGreen
 Tan TealBlue Thistle
 Turquoise Violet VioletRed
 White WildStrawberry Yellow
 YellowGreen YellowOrange

Large colored spaces are possible but are more advanced.

6.3 Defining your own colors

This is 20 percent red and 80 percent white

This is 40 percent red and 60 percent white

This is 50 percent red and 50 percent black

You can read about color mixing in the [xcolor documentation](#)

Resizing (text, code, graphics) can be convoluted in RMarkdown, \LaTeX allows better control.

7 Changing Fonts and Font Size

7.1 Font size

If you want to change a font size temporarily, there are a set of commands, for example:

This is Huge

This is huge

This is LARGE

This is Large

This is large

This is the default called normalsize

This is small

This is footnotesize

This is scriptsize

This is tiny

If you change your text, you will need to issue a “normalsize” to return your text to the default font size for the document (or use some bracketing)

7.2 Font Style

This document is using the package `fontspec` to select a user installed font, this particular document is using something called `Cormorant Garamond Light` (which means you may not be able to compile this document unless you have that font installed). The quotes and letter combinations (e.g., two letter f together) will be handled by TeX and the font is going to 1.2 times larger than normal. If you use `fontspec`, you will need to specify the bold and italic fonts (you don't need to do that if you aren't using `fontspec`), see the header of this RMarkdown document.

Additionally, I can include other fonts if I'm using them less frequently. It's easiest to define the font first with the `newfontfamily` command found in `fontspec` and then use it as its own environment:

First, the definition goes in the header, I'm using fonts that are available on my Mac, these could be seen using the Font Book app on a Mac (there is something comparable in Windows).

Then they can be invoked using the new font names as environments:

This is ComicSansMS

And this is Apple-Chancery

美国 一 二 三 四 五 六 七 八 九 十 劉惠莲

어떻게 지내세요?

I used Google Translate for the Chinese characters and a found a Korean phrase book online and copied and pasted the glyphs into RMarkdown. They will show up when processed but aren't showing up when I try to reveal the unprocessed version for this document (sorry...)

7.3 Line Spacing

The package `setspace` can handle all of your needs and it is the recommended way to change spacing. You can set a document-wide spacing in the header, or locally, for example:

This is
double
line spacing.

This is
one and a half
line spacing.

8 Pagination and Page Numbering

To break a page at any point, just add a `newpage` (see above)

Page numbering will be automatic. To suppress ALL page numbering, use package `gobble`.

To suppress only the first page of page numbering add a `"thispagestyle{empty}"` to the to the specific page.

TEX plus package enumitem does a better job of creating lists. It involves a little more typing but a whole lot more powerful. Try to write this quickly in Markdown:

9 Example: This is a section header same as a pound sign in RMarkdown

9.1 This is a subsection same as a double pound sign

9.1.1 This is a subsubsection same as a triple

1. This is an enumerated list item 1
 - This is a sublist within my enumerated list, first bullet
 - This is a sublist within my enumerated list, second bullet
 - This is a sublist within my enumerated list, third bullet
2. Back to the enumerated list item 2
 - (a) This is a sublist within my enumerated list, item
 - (b) This is a sublist within my enumerated list, item
 - (c) This is a sublist within my enumerated list, item
3. Back to the enumerated list item 3
 - (a) This is a sublist within my enumerated list, item
 - i. This is a subsublist within my enumerated list, item
 - ii. This is a subsublist within my enumerated list, item
 - A. This becomes something like an infinity mirror or something
 - B. Alice down the rabbit hole maybe
 - iii. This is a subsublist within my enumerated list, item
 - (b) This is a sublist within my enumerated list, item
 - (c) This is a sublist within my enumerated list, item