R Handout: Knitr and Dynamic Documents

1 Dynamic Documents

Dynamic documents are documents that are created by running code, and including the results of that code inside of the document automatically (along with regular text). This requires that when the document is created, the code is run (in our case, R will run the code, although it can be done with other programs), and if the code is changed, the document is automatically updated.

2 knitr and Rstudio

The process of creating dynamic documents is usually quite complicated, but Rstudio allows us to make .html files or .pdf's relatively easily. This handout will go over how to use Rstudio to create .html files, as .pdf's require knowledge of LaTex.

3 The .Rmd file

To create a dynamic document in Rstudio, you can select
File → New File → R Markdown...
from the dropdown menus. Then, you will want to give your file a name, put in your name as the author, and select HTML for the file type (it should be the default selection).
This will create a basic document that you can modify, and it also gives you an example of a working .Rmd file. If you now select Knit HTML, R will process the code in the document and the text, and combine them into one whole .html file.

3.1 The Basics

Most text you can just type in as usual in a .Rmd file. There are exceptions, but since they are few and far between, I will not discuss them. Formatting .html documents require a little bit of knowledge of .html formatting. Some formatting options for the .html document are:

- At the beginning of the .Rmd file, we need some commands that set the title, the author and the type of file.

```
---
title: "This is a Test"
author: "Erin Melcon"
output: html_document
---
```

- To create different size headers:

```
# Large Header
## Medium Header
### Smallest Header
```

- To italicize a word or bold a word:

```
*surround it by single asterisks for italicize*

**surround it by two asterisks for bold**
```

- To make lists

  ```
  * A single asterisk begins a list
  * Any additional single asterisks continue the list
  + A plus sign indents the last list
  + Another plus adds another item to the indented list
  1. A number and period starts an ordered list.
  2. The next number and a period continues the list
  + 2a: The formatting for adding subsets to the list is not very sophisticated.
  + 2c: It does not keep track of what number your list is actually at.
  ```

- To create a line break, simply separate the lines by a blank line.

  ```
  Even though it looks like it should,
  this does not actually create a line break.  However, if I add another blank line,

  It does.
  ```

- To add R code that will run and be incorporated into the document, you enclose it in some reference markers:

  ````
  ```{r}
  #This is some R code
  summary(lynx)
  min(lynx)
  max(lynx)
  ```
  ````

  If we don't want the code itself to show in the document, and just the result of our commands, we can add that option:

  ````
  ```{r, echo = FALSE}
  #This is some R code
  summary(lynx)
  min(lynx)
  max(lynx)
  ```
  ````

  If we don't want to run the code, but just display it, we can also do that:

  ````
  ```
  #This is some R code
  summary(lynx)
  min(lynx)
  max(lynx)
  ```
  ````

  You can also use "in-line code", if you don't like that R will print out special boxes for all output (even if it is a single number). To do this, in the middle of a normal sentence, you can add `` `r the.thing` `` where you have saved something in R as the object called `the.thing`. An example of this is included below, and it is typically most useful for when you want to display a single value.

I've combined all the commands above into a simple list that you should be able to copy and paste into the `.Rmd` file, and run to give an example of what all the commands do.
Something to keep in mind is that the code will run every single command that you give it that would normally create some output in `R`.

````
---
title: "This is a Test"
author: "Erin Melcon"
output: html_document
---
# Large Header
## Medium Header
### Smallest Header

*surround it by single asterisks for italicize*
**surround it by two asterisks for bold**
* A single asterisk begins a list
* Any additional single asterisks continue the list
+ A plus sign indents the last list
+ Another plus adds another item to the indented list
1. A number and period starts an ordered list.
2. The next number and a period continues the list
+ 2a: The formatting for adding subsets to the list is not very sophisticated.
+ 2c: It does not keep track of what number your list is actually at.

Even though it looks like it should,
this does not actually create a line break.  However, if I add another blank line,

It does.

```{r}
#This is some R code that shows the output and the code
summary(lynx)
min(lynx)
max(lynx)
```

```{r,echo = FALSE}
#This is some R code that shows only the output
summary(lynx)
min(lynx)
max(lynx)
```

This is an example of using "in-line" code:
```{r,echo = FALSE}
the.mean = mean(lynx)
the.sd = sd(lynx)
```
The mean of the lynx dataset is: `r the.mean`
The std. dev. of the lynx dataset is: `r the.sd`

```
#This is some R code
summary(lynx)
min(lynx)
max(lynx)
```
````