Intro to Beamer
With Illustrations of Integration with R programming

R Users Group

Arizona State Retirement System

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Outline

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1. **Introduction to Beamer**
   - **Why Do We Use Beamer?**
   - Setting Up a Beamer Presentation

2. Integrating Beamer with R

3. Homework

Why do we use Beamer?

1. Beamer is a document class in LATEXused for making slide presentations
2. "Themes" provide automatic formatting and color schemes making it easy to adopt brand standards for presentation style
   1. You declare a theme once at the beginning of your document
   2. You can change that theme and the change the look for your whole document with a single edit
3. Beamer has good tools for academic style presentations with math formulas, footnotes and bibliographies
4. Beamer allows integration with R code and data structures making it easy to incorporate tables and graphs from internal databases or internet sources
   1. Creates a "dynamic" document that automatically updates itself as new data arrives
   2. Implement "reproducible research" since the data and code for analyzing it are transparent and incorporated with the source file or files that create the document

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Template File

- We provide a template file called "beamer template.lyx"
- Open this file in Lyx to get started on a new presentation

The Title Page

- You will notice the title page is pre-populated with entries for Title, Subtitle, Author, Date and Institute

- The Title will appear in the lower right of each page

- The Author will appear in the lower left of each page

- So, you will always want to use these two items
  - But you can substitute something else for "Author" if you want
  - You might use ASRS, for example, if that's what you want to appear in the footer

- If a "short author" is specified, the shortened version will be used in the footer
  - You insert a "short author" from the insert menu
  - The menu is context sensitive and short author will only appear as an option if you are in an author type to begin with

Table of Contents

- Lyx can automatically generate a table of contents for you
- It is based on the "Section" and "Subsection" labels you create throughout the document
- You ask for it by inserting table of contents in a blank frame (more on frames in a moment)
- The template is set up to include a table of contents, which is repeated for context at the beginning of each section

Creating a Frame

- First you enter a frame environment by selecting "Frame" from the drop down list
- Add a title to the frame, move the cursor outside the frame title, hit return
- Then hit tab to initiate the first level of indentation
  - this creates a vertical red line to the left
  - everything inside a frame needs to be inside at least one level of indentation
  - not sure this is how I would have done it, but this is how it works
- Now you (most likely) will hit the "enumerate" or "itemize" to start a bullet or numbered list
  - This is the bulk of most slide presentations
- You need to end your frame
  - Hit return enough times that you exit your bulleted list and all levels of indentationk
  - Make sure are in a "Standard" environment – look at the drop down tab
  - Hit return one more time
  - And you should get a horizontal "separator" line
  - You are ready to start a new slide

Uncovering Bullet Points One at a Time

- This slide gets shown three times, first only with this point

Uncovering Bullet Points One at a Time

- This slide gets shown three times, first only with this point
- Now we add this one – this is done using the Insert/Item Overlay Specification

Uncovering Bullet Points One at a Time

- This slide gets shown three times, first only with this point
- Now we add this one – this is done using the Insert/Item Overlay Specification
- Note the minus sign in the red box – you need that

You Can Show Things in Columns

- You can split a page to multiple columns

- This is tricky

- pay careful attention to how the indentation levels work

You can include a picture or graph stored in a file with insert/graphics

Blocks Help You Dress Up Your Presentation

The First Block on the Page

- First Point
- Second Point

Blocks Help You Dress Up Your Presentation

The First Block on the Page

- First Point
- Second Point

The Second Block on the Page

Note the pause (on the drop down menu) between the blocks causes them to be uncovered one block at a time on two slides

Changing Themes

- Go to Document/Settings then latex preamble
- first line is \usetheme{Warsaw}
- Itry changing Warsaw to Berkeley
- recompile your document and you will get the official University of California look to your presentation
- check out mpetroff.net for a gallery of themes and color schemes for presentations
    - add \usecolortheme{ } to the latex preamble to change the colors, putting whatever color theme you select between the braces
- The ability to change themes for presentations and articles is a key feature of LATEXvalued by its users
    - Academic publications and conference sponsors usually have very specific requirements about formatting documents for their consideration
    - LATEXhas hundreds of document classes and styles that manage the typesetting requirements allowing the author to focus on the content

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Getting Started

- To use R with Lyx, the following have to be set up correctly
  - You need to have R installed on your computer
  - The Path variable in Lyx Tools/Settings needs to provide a correct path to R
  - The Rnw(knitr) module needs to be loaded at Document/modules
    - This module is loaded as a default in our template document
  - The knitr package needs to be installed in R

Invoking R through a code box

- One way to invoke R is through a code box like below. Say we have forgotten what 2+2 is. R can answer that for us like this.
- R, please tell me what is the answer to 2+2. . .

```
## [1] 4
```

- note we are working in a fragile frame environment, selected from the drop down menu
- note the <<. . .>>= in the first and @ in the last line
- these are required text that signal to Lyx that what is in between is R code
- "echo=FALSE" is a "chunk option" that instructs not to include the R code in the final document
- more on chunk options later

Invoking R "in line" with your text

- You can invoke R in line
- Again we have forgotten what 2+2 is and invoke R using the LATEXcommand "Sexpr" to find out that the sum of these two integers is 4 [1]
  - You create a code box with ctrl-L
  - the R code is placed between braces following \Sexpr
- This is a powerful feature that you should use a lot to make your documents dynamic so they update themselves as data change
  - We will illustrate this with more compelling examples in the coming slides

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[1]The reason the command for this is "Sexpr" as opposed to, say, "Rexpr" is that the original name for R was S. S was a statistical language developed at Bell Labs in the 1970's. When it became open source, it was renamed R.

Invoking R using a parallel script file

- This is the best way to do it that will save you a lot of time in debugging if you have more than a trivial amount of R code
- We have provided a separate file working with the books data base called books.r
  - note this is an R script, not markdown or a notebook
- First we read in the R script like this

- treat the chunk options as a magical invocation (it works, but I can't explain why cache needs to be FALSE)
- in the open books.r and look at it
- you will see it is divided into sections labeled "## @knitr <section-name>"
  - where <section-name> is used inside Lyx to invoke that chunk of code
- We're to get going

Talk about the books data base

- I run the chunk "setup" to read in the data

- Now I have access to the database

- There are 754 books in the database by 504 different authors

- I have read 284 of the books

- Note this is a dynamic document – if the data changes, the document automatically updates with it

# A table of the authors most frequently in the data base

- We run the next chunk which produces the table

	Author	Freq
1	Roth, Philip	12
2	Updike, John	10
3	Munro, Alice	8
4	Bellow, Saul	7
5	Faulkner, William	7
6	Hemingway, Ernest	6

- Note the use of the xtable function
  - this is how you generate a table for use in a LATEXdocument
  - results = 'asis' a necessary chunk option when you are using xtable
  - this is the simplest use, but there are many options and great flexibility
  - it's frustrating to learn, but in the end very powerful
  - for those of you familiar with the private markets monthly report, the whole thing is generated with xtable
- Also note use of vertical space to improve formatting of page – found at insert/formatting

Are my reading habits biased to more recent fiction?

- Based on this chart, looks like they are
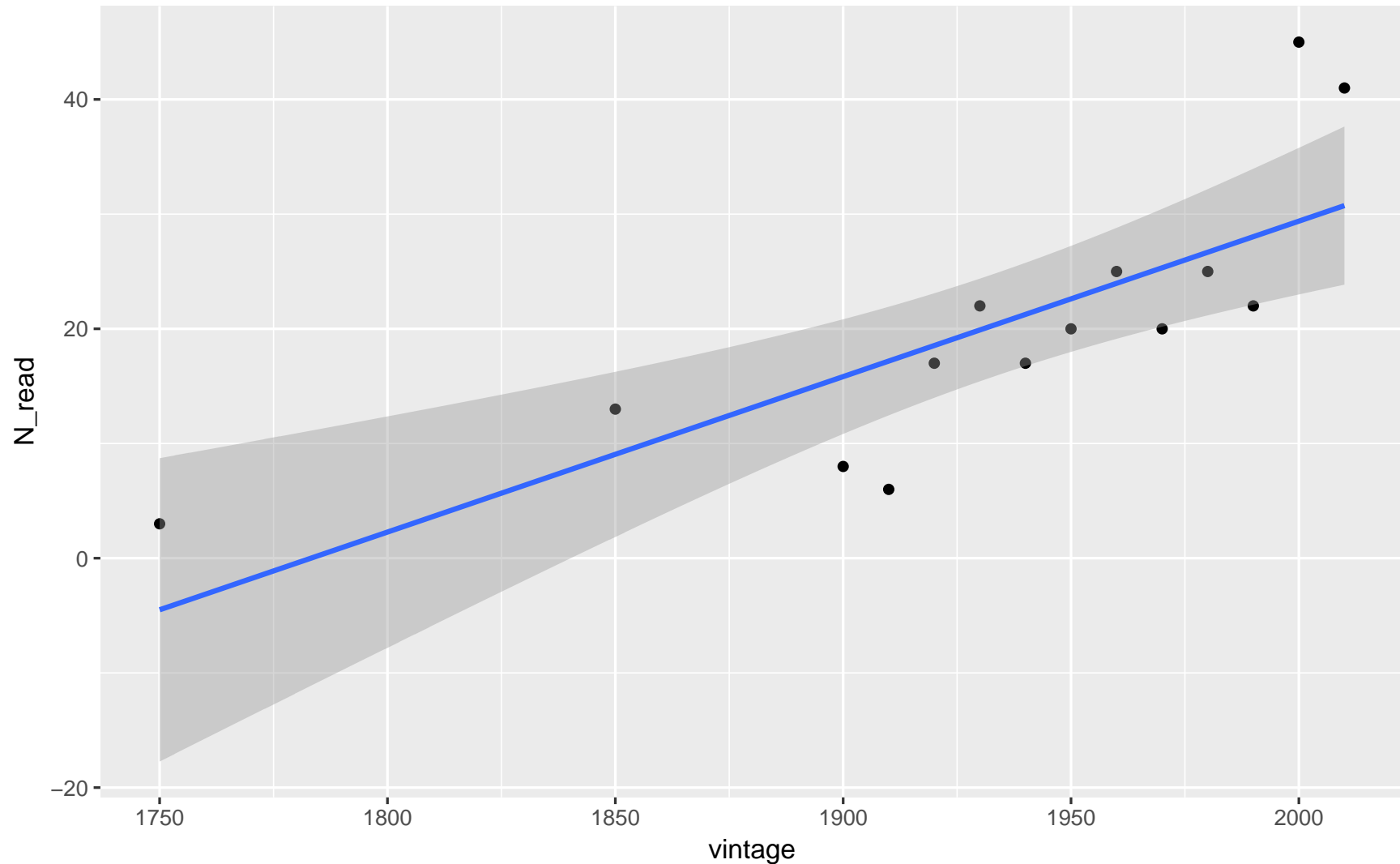
Let's check the regression statistics to confirm

- With a t value>4 for the slope, this confirms a bias toward more recent fiction

	Estimate	Std. Error	t value	Pr(>|t|)
(Intercept)	-241.7045	60.3838	-4.00	0.0018
dec_read.df$vintage	0.1355	0.0312	4.34	0.0010

- Note xtable has a method for regression results that produces a nice summary with simple coding
- Google xtable and you will find a manual and a gallery of results illustrating many different situations and applications

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- Add some more frames to this deck concerning the books database
- Create a new deck using the Amazon, IBM, Apple stock prices
    - Convert your earlier markdown presentation to a beamer deck
    - expand the analysis by adding SPX Index to the data and do stuff like calculate beta relative to the index, performance compared to index, etc