1 Usage

1.1 Components

Text can be **bolded** with \textbf{...}. Text can be *italicized* with \textit{...}. Use typewriter font with \texttt{...}. Text can be <u>underlined</u> with \myuline{}. <u>ajklpixby</u>

Setup for underlining uses the following code in the preamble:

```
\usepackage{contour}
\usepackage[normalem]{ulem}

\renewcommand{\ULdepth}{1.8pt}
\contourlength{1.2pt}

\newcommand{\myuline}[1]{%
  \uline{\phantom{#1}}%
  \llap{\contour{white}{#1}}%
}
```

See this post.

Header. Section headings are preceded by pound signs, the number of which denote the heading style.

```
# First-level header

## Second-level header

### Third-level header
```

To-Do:

- subscript, superscript

- small caps

- hyperlinks

- images

- footnotes

- citations

- syntax highlighting

- lists

- quotes

- code blocks

- align, gather, equation environments

- latex packages

- theorem, definition, example, proposition, claim, lemma, proof, remark, exercise

- PART

- Text Referencing

- R code chunks and inline R code

- Figures, captions, aspect ratio, position

- Tables

- cross-referencing

Align. No numbering $\implies$ use `align`* environment.

$$a^2 + b^2 = c^2$$
$$(a + b)^2 = a^2 + 2ab + b^2.$$

Use `\numberthis` to add number (see `preamble.tex`).

$$a^2 + b^2 = c^2 \tag{1}$$
$$(a + b)^2 = a^2 + 2ab + b^2.$$

Use `\nonumber` to suppress numbering in `align` environment

$$a^2 + b^2 = c^2$$
$$(a + b)^2 = a^2 + 2ab + b^2. \tag{2}$$

Center number within an `equation` environment using the `split` environment. Also see alternative method in (5). Label with (`\#eq:label`). Reference with `\@ref(eq:label)`. See (3).

$$
\begin{aligned}
\text{Var}(\hat{\beta}) &= \text{Var}((X'X)^{-1}X'y) \\
&= (X'X)^{-1}X'\text{Var}(y)((X'X)^{-1}X')' \\
&= (X'X)^{-1}X'\text{Var}(y)X(X'X)^{-1} \\
&= (X'X)^{-1}X'\sigma^2 I X(X'X)^{-1} \\
&= (X'X)^{-1}\sigma^2
\end{aligned}
\tag{3}
$$

1.1.2.1 Demo A normal paragraph.

```r
ggplot(mtcars, aes(x = wt, y = qsec, color = cyl)) +
  geom_point()
```
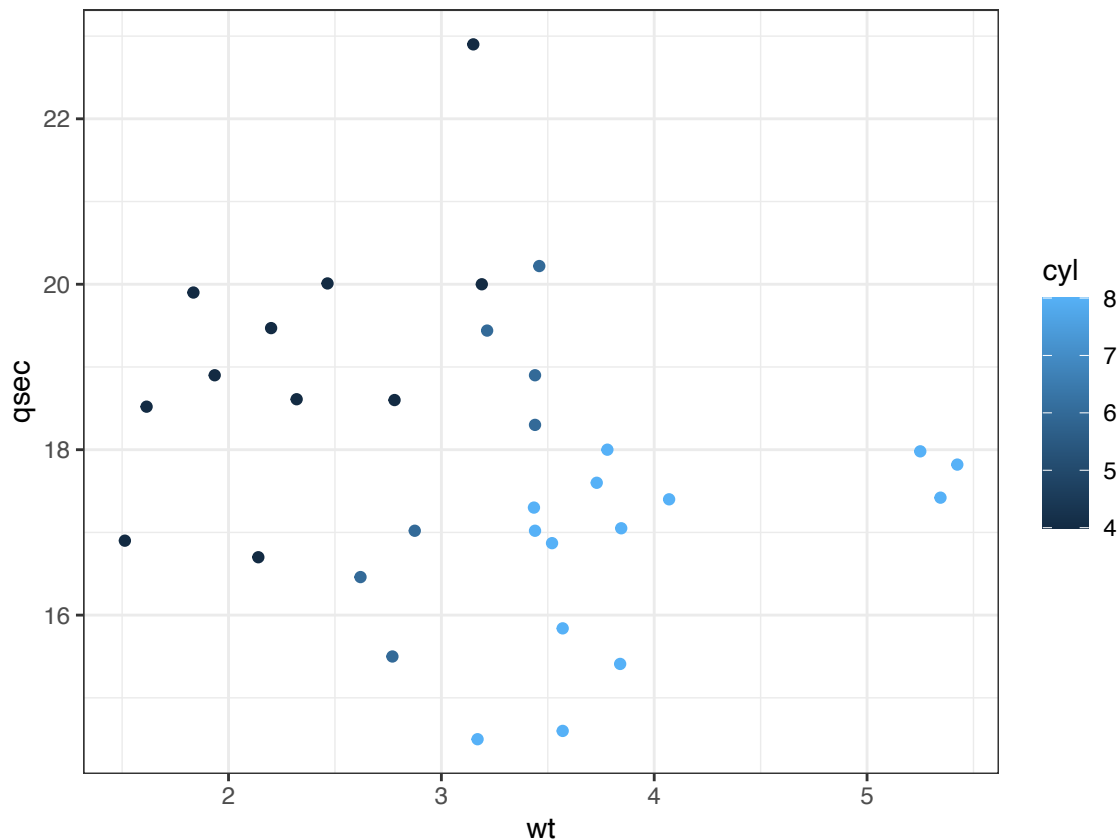

Figure 1: A scatterplot of the data `cars` using **base** R graphics.

```r
print("hi")
#> [1] "hi"
```

See Chapter 2.

2 Environments

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Aenean et tortor at risus viverra adipiscing at in. Faucibus interdum posuere lorem ipsum dolor sit. Pulvinar elementum integer enim neque volutpat ac tincidunt vitae. Malesuada nunc vel risus commodo viverra maecenas accumsan. Nunc aliquet bibendum enim facilisis gravida neque. Sed nisi lacus sed viverra tellus in. Tincidunt tortor aliquam nulla facilisi cras fermentum odio. Nec dui nunc mattis enim. Sem integer vitae justo eget magna fermentum iaculis eu non. Magna eget est lorem ipsum dolor. Id volutpat lacus laoreet non curabitur gravida.

Facilisis volutpat est velit egestas dui id. Odio euismod lacinia at quis risus sed. Cursus vitae congue mauris rhoncus aenean vel elit. Lectus sit amet est placerat in egestas erat imperdiet. Sapien

nec sagittis aliquam malesuada bibendum arcu. A scelerisque purus semper eget duis at tellus at urna.

> **Theorem 2.1: Pythogorean Theorem**
>
> For a right triangle, if c denotes the length of the hypotenuse and a and b denote the lengths of the other two sides, we have
> $$a^2 + b^2 = c^2$$

See Theorem 2.1.

Morbi non arcu risus quis varius. Id diam vel quam elementum pulvinar etiam non. Volutpat blandit aliquam etiam erat velit scelerisque in dictum. Ultricies integer quis auctor elit sed vulputate.

At tempor commodo ullamcorper a lacus vestibulum sed. Dictum at tempor commodo ullamcorper a lacus vestibulum sed. Feugiat pretium nibh ipsum consequat nisl vel pretium. Quis risus sed vulputate odio ut enim blandit volutpat maecenas. Enim ut sem viverra aliquet eget sit. Vestibulum mattis ullamcorper velit sed. Nulla facilisi nullam vehicula ipsum a. Dignissim sodales ut eu sem integer. Mattis pellentesque id nibh tortor id. Sollicitudin ac orci phasellus egestas tellus rutrum. Tellus cras adipiscing enim eu turpis. Velit laoreet id donec ultrices tincidunt arcu non sodales. Ultrices neque ornare aenean euismod elementum. Ultrices dui sapien eget mi proin sed libero enim. Ornare suspendisse sed nisi lacus sed viverra tellus in hac. Porttitor leo a diam sollicitudin. Egestas sed sed risus pretium quam vulputate. Sem viverra aliquet eget sit amet. Quisque sagittis purus sit amet.

$$
\begin{aligned}
a^2 + b^2 &= c^2 \\
(a+b)^2 &= a^2 + 2ab + b^2.
\end{aligned}
\tag{4}
$$

$$
\begin{aligned}
\operatorname{Var}(\hat{\beta}) &= \operatorname{Var}((X'X)^{-1}X'y) \\
&= (X'X)^{-1}X'\operatorname{Var}(y)((X'X)^{-1}X')' \\
&= (X'X)^{-1}X'\operatorname{Var}(y)X(X'X)^{-1} \\
&= (X'X)^{-1}X'\sigma^2 I X(X'X)^{-1} \\
&= (X'X)^{-1}\sigma^2
\end{aligned}
\tag{5}
$$

Habitant morbi tristique senectus et netus. Urna molestie at elementum eu facilisis sed. Ornare massa eget egestas purus viverra accumsan. Auctor elit sed vulputate mi sit amet mauris. Sit amet massa vitae tortor condimentum. Arcu cursus vitae congue mauris rhoncus. Imperdiet proin fermentum leo vel orci porta non pulvinar. Tellus orci ac auctor augue mauris augue.

> **Proposition 2.1: Hi**
>
> This proposition is cool.

Proof. Are propositions supposed to be proved? □

Claim 2.1

This proposition is new.

See Claim 2.1.

Consectetur a erat nam at lectus urna duis convallis convallis. Libero id faucibus nisl tincidunt. A diam sollicitudin tempor id eu nisl nunc. Sed lectus vestibulum mattis ullamcorper velit sed ullamcorper morbi. Metus aliquam eleifend mi in nulla posuere sollicitudin. Molestie ac feugiat sed lectus vestibulum mattis ullamcorper velit. Nec ultrices dui sapien eget mi proin sed libero.

Tincidunt id aliquet risus feugiat. Urna nunc id cursus metus aliquam eleifend mi in. Eu augue ut lectus arcu bibendum at varius vel. Volutpat diam ut venenatis tellus in metus vulputate eu scelerisque.

Remark 1. Phasellus egestas tellus rutrum tellus pellentesque eu tincidunt tortor. Donec massa sapien faucibus et molestie ac. Sed blandit libero volutpat sed cras ornare. Adipiscing elit pellentesque habitant morbi tristique senectus et. Integer malesuada nunc vel risus commodo viverra maecenas accumsan lacus.

Remark. Phasellus egestas tellus rutrum tellus pellentesque eu tincidunt tortor. Donec massa sapien faucibus et molestie ac. Sed blandit libero volutpat sed cras ornare. Adipiscing elit pellentesque habitant morbi tristique senectus et. Integer malesuada nunc vel risus commodo viverra maecenas accumsan lacus.

Definition 2.1: Subset

A set A is said to be a *subset* of B if for all $a \in A$, we have that $a \in B$.

See Definition 2.1.

Example 2.1: My first example

a da

Example 2.2

My second example.

See Example 2.2.

> **Exercise 2.1: Variance of OLS Estimator**
>
> Lectus vestibulum mattis ullamcorper velit sed ullamcorper morbi tincidunt ornare. Eu non diam phasellus vestibulum lorem sed risus. Neque ornare aenean euismod elementum nisi quis eleifend quam. Faucibus purus in massa tempor nec feugiat nisl pretium. Lorem sed risus ultricies tristique.
>
> Find $\text{Var}(\hat{\beta})$.
>
> Lectus vestibulum mattis ullamcorper velit sed ullamcorper morbi tincidunt ornare. Eu non diam phasellus vestibulum lorem sed risus. Neque ornare aenean euismod elementum nisi quis eleifend quam. Faucibus purus in massa tempor nec feugiat nisl pretium. Lorem sed risus ultricies tristique.
>
> Lectus vestibulum mattis ullamcorper velit sed ullamcorper morbi tincidunt ornare. Eu non diam phasellus vestibulum lorem sed risus. Neque ornare aenean euismod elementum nisi quis eleifend quam. Faucibus purus in massa tempor nec feugiat nisl pretium. Lorem sed risus ultricies tristique.

See 2.1.

> **Exercise 2.2**
>
> Another exercise.

Vitae justo eget magna fermentum iaculis eu non. Gravida dictum fusce ut placerat orci. Et egestas quis ipsum suspendisse ultrices gravida dictum fusce ut.

> **Exercise 2.3**
>
> Another exercise.

> **Exercise 2.4**
>
> Another exercise.

Consequat semper viverra nam libero justo. Amet purus gravida quis blandit. Mauris pharetra et ultrices neque ornare. See Theorem 2.2.

> **Theorem 2.2: Pythagoras' theorem**
>
> In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the catheti.
>
> $$a^2 + b^2 = c^2$$

3 Section

3.1 Title of Slide

- Item 1

    - Subitem 1. Let this be a really long piece of text. Let's see if it wraps around. How is the indentation?

    - Subitem 2

- Item 2

- $a^2 + b^2$

Torgovitsky (2020)

Kamat, Mogstad, and Torgovitsky (2020)

3.2 New Slide

$\mathbb{E}(x)$

```r
print("hello")
#> [1] "hello"
summary(iris)
#>   Sepal.Length    Sepal.Width     Petal.Length    Petal.Width
#>   Min.   :4.300   Min.   :2.000   Min.   :1.000   Min.   :0.100
#>   1st Qu.:5.100   1st Qu.:2.800   1st Qu.:1.600   1st Qu.:0.300
#>   Median :5.800   Median :3.000   Median :4.350   Median :1.300
#>   Mean   :5.843   Mean   :3.057   Mean   :3.758   Mean   :1.199
#>   3rd Qu.:6.400   3rd Qu.:3.300   3rd Qu.:5.100   3rd Qu.:1.800
#>   Max.   :7.900   Max.   :4.400   Max.   :6.900   Max.   :2.500
#>        Species
#>   setosa    :50
#>   versicolor:50
#>   virginica :50
#>
#>
#>
```
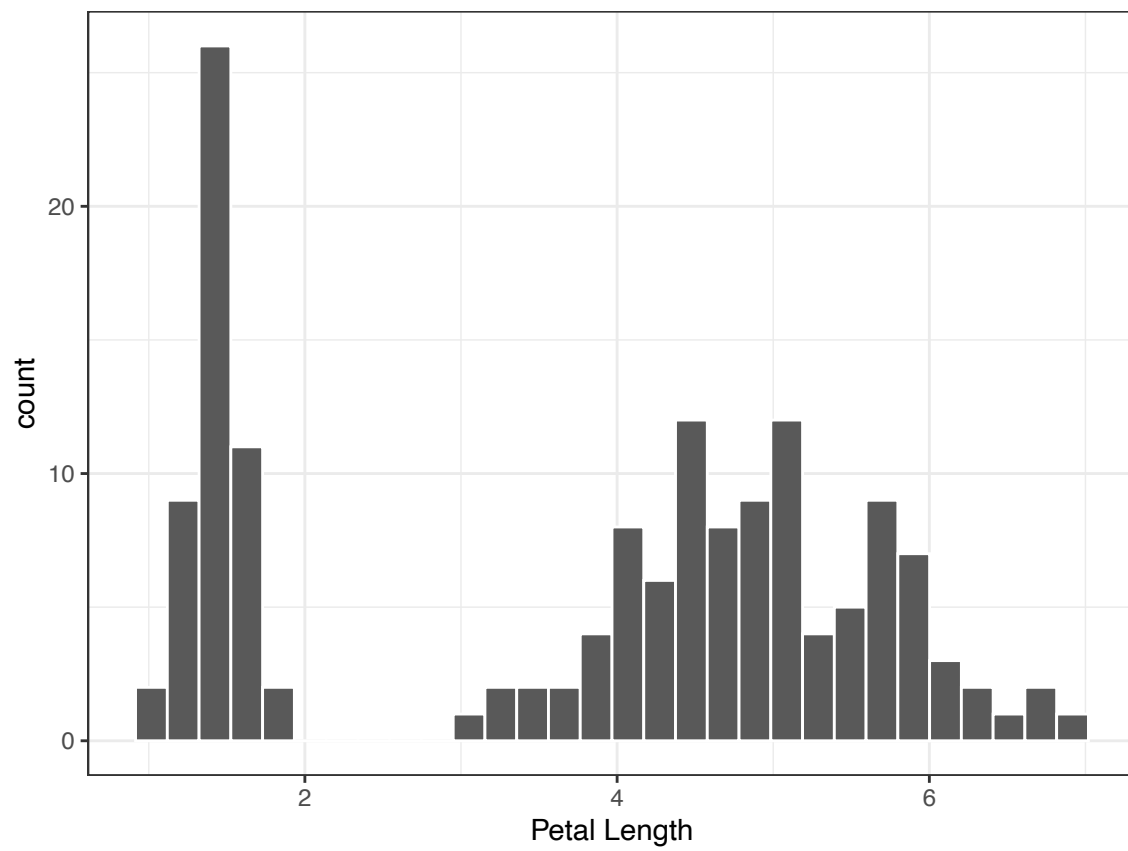
3.3 Blocks

Definition 3.1: Hello

Define the definition of definition.

Alert. Attention This is important.

Example 3.1: salutations

Farewell, till next time.

3.4 Plot

References

Kamat, Vishal, Magne Mogstad, and Alexander Torgovitsky. 2020. "Extrapolation in Regression Discontinuity Designs."

Torgovitsky, Alexander. 2020. "Rdextrap Module Design."

Xie, Yihui. 2016. *Bookdown: Authoring Books and Technical Documents with R Markdown.* CRC Press.