

A Minimal Book Example

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Chapter 1

About

This is a *sample* book written in **Markdown**. You can use anything that Pandoc’s Markdown supports; for example, a math equation $a^2 + b^2 = c^2$.

1.1 Usage

Each **bookdown** chapter is an .Rmd file, and each .Rmd file can contain one (and only one) chapter. A chapter *must* start with a first-level heading: **# A good chapter**, and can contain one (and only one) first-level heading.

Use second-level and higher headings within chapters like: **## A short section** or **### An even shorter section**.

The `index.Rmd` file is required, and is also your first book chapter. It will be the homepage when you render the book.

1.2 Render book

You can render the HTML version of this example book without changing anything:

1. Find the **Build** pane in the RStudio IDE, and
2. Click on **Build Book**, then select your output format, or select “All formats” if you’d like to use multiple formats from the same book source files.

Or build the book from the R console:

```
bookdown::render_book()
```

To render this example to PDF as a `bookdown::pdf_book`, you'll need to install XeLaTeX. You are recommended to install TinyTeX (which includes XeLaTeX): <https://yihui.org/tinytex/>.

1.3 Preview book

As you work, you may start a local server to live preview this HTML book. This preview will update as you edit the book when you save individual .Rmd files. You can start the server in a work session by using the RStudio add-in “Preview book”, or from the R console:

```
bookdown::serve_book()
```

Chapter 2

Hello bookdown

All chapters start with a first-level heading followed by your chapter title, like the line above. There should be only one first-level heading (#) per .Rmd file.

2.1 A section

All chapter sections start with a second-level (##) or higher heading followed by your section title, like the sections above and below here. You can have as many as you want within a chapter.

An unnumbered section

Chapters and sections are numbered by default. To un-number a heading, add a {.unnumbered} or the shorter {-} at the end of the heading, like in this section.

Chapter 3

Cross-references

Cross-references make it easier for your readers to find and link to elements in your book.

3.1 Chapters and sub-chapters

There are two steps to cross-reference any heading:

1. Label the heading: `# Hello world {#nice-label}`.
 - Leave the label off if you like the automated heading generated based on your heading title: for example, `# Hello world = # Hello world {#hello-world}`.
 - To label an un-numbered heading, use: `# Hello world {-#nice-label}` or `{# Hello world .unnumbered}`.
2. Next, reference the labeled heading anywhere in the text using `\@ref(nice-label)`; for example, please see Chapter 3.
 - If you prefer text as the link instead of a numbered reference use: any text you want can go here.

3.2 Captioned figures and tables

Figures and tables *with captions* can also be cross-referenced from elsewhere in your book using `\@ref(fig:chunk-label)` and `\@ref(tab:chunk-label)`, respectively.

See Figure 3.1.

```
par(mar = c(4, 4, .1, .1))  
plot(pressure, type = 'b', pch = 19)
```



Figure 3.1: Here is a nice figure!

Don't miss Table 3.1.

```
knitr::kable(  
  head(pressure, 10), caption = 'Here is a nice table!',  
  booktabs = TRUE  
)
```

Table 3.1: Here is a nice table!

temperature	pressure
0	0.0002
20	0.0012
40	0.0060
60	0.0300
80	0.0900
100	0.2700
120	0.7500
140	1.8500
160	4.2000
180	8.8000

Chapter 4

Methodology

4.0.1 Variables

4.0.1.1 Categories that would be useful (things to predict?)

Owner-occupied? Investor-owned? Vacant? Demolition in the past year (no construction since) Construction in the past year

4.0.1.2 factor analysis Variables

The variables made it into the initial factor analysis were:

- Accessibility
 - Distance to transit (use number of transit stops within 1/2 mile walkshed)
 - Share of old/new homes (use average age of homes within 1/2 mile walkshed)
 - Transit frequency (use transit stops per hour within 1/2 mile walkshed)
- Affordability
 - Average Condition of homes in half-mile walkshed
 - Median rent of block-groups with centroids within 1/2 mile walkshed.
 - Median income of block groups with centroids within 1/2 mile walkshed.
 - Median ownership cost of block groups with centroids within 1/2 mile walkshed.

- Close
 -
- Diverse buildings
 - Entropy of housing types (apartment, townhomes, etc) within 1/2 mile walkshed
- Other
 - Standard deviation of building age within 1/2 mile walkshed

4.1 Data

We obtained data on parcel addresses, land uses, assessed values (for both land and buildings), and building condition from the Western Pennsylvania Regional Data Center (WPRDC), as provided by the Office of Property Assessments in Allegheny County. Data were available for 582,116 properties.

We also obtained latitude and longitude coordinates from the WPRDC. Over 99.5 percent of properties included in the assessment dataset are included in the geocoder file. Properties without geocoded locations are excluded from our analysis, leaving a total of 579,473 properties.

Potential development sites were identified as those

1. classified as “residential” (indicating residential properties with one to four housing units) or “commercial” (which includes mixed-use developments and residential properties with more than four housing units) and
2. with a land use description in one of 59 possible categories. The most common of these are listed Table 4.1^[The land use descriptions that were classified as potential development sites but a site (3008 Phillip Dr in Clairton) is missing a land use description in the assessment data, but we checked this address on Zillow to determine that this is a single-family home and classified it as such in our data.]

Warning: One or more parsing issues, see ``problems()`` for details

The above criteria yield 531,811 potential sites. Potential building sites were further filtered to exclude those with missing data on the most recent sale (6,574 sites, or about one percent of all sites)¹ for a total of 526,237 potential sites.

¹Four sites had sales prices listed that were unreasonably high. 3039 Liberty Avenue in Pittsburgh is listed as having sold for \$511,945,000 on August 30, 2021. Zillow lists this property as having sold on that date for \$511,945 (https://www.zillow.com/homedetails/3039-W-Liberty-Ave-Pittsburgh-PA-15216/2070262638_zpid/, accessed 5/4/2022), so the value

Table 4.1: Most common land uses categorized as potential sites

USEDESC	Number of potential sites	Percent of potential sites	Cumulative
SINGLE FAMILY	371,064	69.8	
VACANT LAND	63,603	12.0	
TWO FAMILY	17,330	3.3	
CONDOMINIUM	16,683	3.1	
TOWNHOUSE	14,953	2.8	
ROWHOUSE	11,129	2.1	
VACANT COMMERCIAL LAND	6,103	1.1	
THREE FAMILY	3,977	0.7	
RES AUX BUILDING (NO HOUSE)	3,635	0.7	
RETL/APT'S OVER	3,366	0.6	
COMM AUX BUILDING	3,040	0.6	
APART: 5-19 UNITS	2,800	0.5	
MOBILE HOME (IN PARK)	2,563	0.5	
FOUR FAMILY	2,064	0.4	
BUILDERS LOT	1,714	0.3	
CONDOMINIUM COMMON PROPERTY	1,307	0.2	
PARKING GARAGE/LOTS	935	0.2	
OFFICE/APARTMENTS OVER	860	0.2	
MOBILE HOME	676	0.1	
APART:40+ UNITS	545	0.1	

4.1.1 Aspatial data

Three variables (total assessed fair market value, assessed fair market value of the building, and lot area) were taken directly from the assessment data for use in our analysis. We calculated two additional variables from the assessment data: the inflation-adjusted sales price and the average number of years between sales. The average of:

1. The number of years between the most recent sale and the publication data of the assessment data (May 1, 2022);
2. The number of years between the most recent sale and the second-most recent sale²; and
3. The number of years between the second-most recent sale and the third-most recent sale, if a third-most recent sale is listed.

4.1.2 Accessibilty data

For each parcel ID above:

- Job access by transit
- Job access by car
- Walk access to schools
- Walk access to grocery
- Walk access to parks

4.1.3 Density data

- Housing density (use number of homes within 1/2 mile circle)
- Ped network density (use mileage of ped network within 1/2 mile circle)

was corrected for what appears to have been a typo. 220 Hyeholde Dr in Coraopolis is listed as having sold for \$28,100,000 in 1967. This may also be a typo, and it is also not the most recent sale. Zillow lists this home as having sold for \$350,000 in 2004 (https://www.zillow.com/homes/220-hyeholde-dr,-Coraopolis,-PA_rb/11552817_zpid/, accessed 5/4/2022, so the data was corrected to add that as the most recent sale. Two other sites were identified as having unreasonably high sales values: 1339 Arlington Avenue in Pittsburgh is a three-bedroom single-family home that is listed as having sold for \$57,010,813 in 1976 and a vacant lot with tax ID 0165G00270000000 is a 0.06-acre vacant lot that is listed as having sold for \$24,920,232 in 1936. The sales data for these sites were treated as missing.

²If no date is listed for the second-most recent sale, we used January 1, 1950. The data user guide notes that, although deeds have been recorded in Allegheny County since 1788 (and the earliest sale listed in the data is from November 24, 1806), early sales may not be included in the electronic system and may default to a 1950 sale date [Center, 2017]. This effects about one third of parcels in our dataset.

4.1.4 Walkshed data

Number of jobs within 1/2 mile walkshed (separate by industry/type)

Chapter 5

Footnotes and citations

5.1 Footnotes

Footnotes are put inside the square brackets after a caret `^[]`. Like this one ¹.

5.2 Citations

Reference items in your bibliography file(s) using `@key`.

For example, we are using the **bookdown** package [Xie, 2022] (check out the last code chunk in `index.Rmd` to see how this citation key was added) in this sample book, which was built on top of R Markdown and **knitr** [?] (this citation was added manually in an external file `book.bib`). Note that the `.bib` files need to be listed in the `index.Rmd` with the YAML `bibliography` key.

The RStudio Visual Markdown Editor can also make it easier to insert citations: <https://rstudio.github.io/visual-markdown-editing/#/citations>

¹This is a footnote.

Chapter 6

Blocks

6.1 Equations

Here is an equation.

$$f(k) = \binom{n}{k} p^k (1-p)^{n-k} \quad (6.1)$$

You may refer to using `\@ref{eq:binom}`, like see Equation (6.1).

6.2 Theorems and proofs

Labeled theorems can be referenced in text using `\@ref{thm:tri}`, for example, check out this smart theorem 6.1.

Theorem 6.1. *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*

$$a^2 + b^2 = c^2$$

Read more here <https://bookdown.org/yihui/bookdown/markdown-extensions-by-bookdown.html>.

6.3 Callout blocks

The R Markdown Cookbook provides more help on how to use custom blocks to design your own callouts: <https://bookdown.org/yihui/rmarkdown-cookbook/custom-blocks.html>

Chapter 7

Sharing your book

7.1 Publishing

HTML books can be published online, see: <https://bookdown.org/yihui/bookdown/publishing.html>

7.2 404 pages

By default, users will be directed to a 404 page if they try to access a webpage that cannot be found. If you'd like to customize your 404 page instead of using the default, you may add either a `_404.Rmd` or `_404.md` file to your project root and use code and/or Markdown syntax.

7.3 Metadata for sharing

Bookdown HTML books will provide HTML metadata for social sharing on platforms like Twitter, Facebook, and LinkedIn, using information you provide in the `index.Rmd` YAML. To setup, set the `url` for your book and the path to your `cover-image` file. Your book's `title` and `description` are also used.

This `gitbook` uses the same social sharing data across all chapters in your book—all links shared will look the same.

Specify your book's source repository on GitHub using the `edit` key under the configuration options in the `_output.yml` file, which allows users to suggest an edit by linking to a chapter's source file.

Read more about the features of this output format here:

<https://pkgs.rstudio.com/bookdown/reference/gitbook.html>

Or use:

```
?bookdown::gitbook
```


Bibliography

Western Pennsylvania Regional Data Center. Allegheny County Property Assessment Data User Guide. Technical report, Pittsburgh, PA, April 2017. URL <https://data.wprdc.org/dataset/2b3df818-601e-4f06-b150-643557229491/resource/cc4bafd2-25b6-41d7-83aa-d16bc211b020/download/allegHENYcountypropertyassessmentdatauserguide-4.pdf>.

Yihui Xie. *bookdown: Authoring Books and Technical Documents with R Markdown*, 2022. URL <https://CRAN.R-project.org/package=bookdown>. R package version 0.25.