

# A Minimal Book Example

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# Chapter 1

## Prerequisites

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

The **bookdown** package can be installed from CRAN or Github:

```
install.packages("bookdown")  
# or the development version  
# devtools::install_github("rstudio/bookdown")
```

Remember each Rmd file contains one and only one chapter, and a chapter is defined by the first-level heading #.

To compile this example to PDF, you need XeLaTeX. You are recommended to install TinyTeX (which includes XeLaTeX): <https://yihui.name/tinytex/>.



## Chapter 2

# Introduction

You can label chapter and section titles using `{#label}` after them, e.g., we can reference Chapter 2. If you do not manually label them, there will be automatic labels anyway, e.g., Chapter 4.

Figures and tables with captions will be placed in `figure` and `table` environments, respectively.

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

Reference a figure by its code chunk label with the `fig:` prefix, e.g., see Figure 2.1. Similarly, you can reference tables generated from `knitr::kable()`, e.g., see Table 2.1.

```
knitr::kable(
  head(iris, 20), caption = 'Here is a nice table!',
  booktabs = TRUE
)
```

You can write citations, too. For example, we are using the **bookdown** package (Xie, 2018) in this sample book, which was built on top of R Markdown and **knitr** (Xie, 2015).



Figure 2.1: Here is a nice figure!

Table 2.1: Here is a nice table!

Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
5.1	3.5	1.4	0.2	setosa
4.9	3.0	1.4	0.2	setosa
4.7	3.2	1.3	0.2	setosa
4.6	3.1	1.5	0.2	setosa
5.0	3.6	1.4	0.2	setosa
5.4	3.9	1.7	0.4	setosa
4.6	3.4	1.4	0.3	setosa
5.0	3.4	1.5	0.2	setosa
4.4	2.9	1.4	0.2	setosa
4.9	3.1	1.5	0.1	setosa
5.4	3.7	1.5	0.2	setosa
4.8	3.4	1.6	0.2	setosa
4.8	3.0	1.4	0.1	setosa
4.3	3.0	1.1	0.1	setosa
5.8	4.0	1.2	0.2	setosa
5.7	4.4	1.5	0.4	setosa
5.4	3.9	1.3	0.4	setosa
5.1	3.5	1.4	0.3	setosa
5.7	3.8	1.7	0.3	setosa
5.1	3.8	1.5	0.3	setosa



## Chapter 3

# Literature

Here is a review of existing methods.



## Chapter 4

# Methods

We describe our methods in this chapter.



## Chapter 5

# Applications

Some *significant* applications are demonstrated in this chapter.

### 5.1 Example one

### 5.2 Example two



## Chapter 6

# Allan Variance

- The Allan Variance (AV) is a statistical technique originally developed in the mid-1960s to study the stability of precision oscillators (see e.g. Allan, 1966).
- It can provide information on the types and magnitude of various superimposed noise terms (i.e. composite stochastic processes).
- This method has been adapted to characterize the properties of a variety of devices including inertial sensors (see El-Sheimy et al., 2008).
- The AV is a measure of variability developed for long term memory processes and can in fact be interpreted as a Haar wavelet coefficient variance (see Percival and Guttorp, 1994). We will discuss this connection further on.

**Definition 6.1.** We consider the AV at dyadic scales  $(\tau_j)$  starting from local averages of the process which can be denoted as

$$\bar{X}_t^{(j)} \equiv \frac{1}{\tau_j} \sum_{i=1}^{\tau_j} X_{t-\tau_j+i},$$

where  $\tau_j \equiv 2^j$ ,  $j \in \{x \in \mathbb{N} : 1 \leq x < \log_2(T) - 1\}$  therefore determines the number of consecutive observations considered for the average. Then, the AV is defined as

$$AV_j(X_t) \equiv \frac{1}{2} \mathbb{E} \left[ \left( \bar{X}_t^{(j)} - \bar{X}_{t-\tau_j}^{(j)} \right)^2 \right].$$

*Remark (fsgsv).* The definition of the AV is actually valid for ...





## Chapter 7

# Final Words

We have finished a nice book.



# Bibliography

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