Cox Proportional Hazard Model in Political Science

Read-Ahead Document

Shaka Y.J. Li   David Akindoyin

2025-11-21

Table of contents

1 Introduction to Survival (Duration) Analysis

What is "survival" in political science? In political science, survival analysis is often used to study the duration of political events or institutions. For example, we may want to know how long a regime survives before collapsing, how long a cabinet remains in office, or how long a particular leader stays in power. In this workshop, we first explore the basic concept for duration model. Then, we introduce the idea behind Cox Proportional Hazard Model and explain how to model duration data based on this model. To make the concept more concrete, we then introduce two examples with `R` in political science and medical science to help the audience have better sense. We conclude by stating the importance of duration data and model in political science and future direction about this.

2 Preparing the data

The dataset for this workshop is available on GitHub repository [1]. After cloning or downloading the repository, open R and enter the following command:

```r
# Preparing the data for example 1
new_df <- read.csv("example.csv")

# Preparing the data for example 2
# install.packages("survival")
library(survival)
veteran <- survival::veteran
```

3 Installing and Librarying Packages

During the workshop, we will introduce how to fit the Cox model, analyze the counterfactual prediction, and interpret the results. So before participating the workshop, please make sure the following packages are installed and libraried:

```r
# Install packages if not already installed
# install.packages(c("survival", "marginaleffects", "ggplot2", "survminer", "rsample"))

library(survival)                                                    ①
library(marginaleffects)                                             ②
library(ggplot2)                                                     ③
library(survminer)                                                   ④
library(rsample)                                                     ⑤
library(dplyr)                                                       ⑥
```

① Core package for fitting survival models (e.g., coxph, survfit)
② For computing and visualizing marginal effects or differences

---

[1] If the link above doesn't open, you can also visit the following URL: https://github.com/shaka-li/Cox-Proportional-Hazard-Model-in-Political-Science.

③ For creating customized plots
④ For convenient survival analysis visualization (e.g., ggsurvplot)
⑤ For semi-parametric bootstraping
⑥ So that we can use dplyr to factor variables

References