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# Gradient Curve of Cox Proportional Harzard and Weibull Models

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## Abstract

This examination focuses on the correlation between the inclination bend of the cox relative risk and weibull models. It has two faces, the reenacted and the genuine information approach. The information utilized for this examination work is on tuberculosis sicknesses for the year 2011. It was seen from the genuine information that the shape boundary of the weibull model doesn't depend or have impact on the exhibition of the Cox relative peril model. It was moreover seen that the two models perform comparatively when the distributional presumptions are not met with the exception of when test size is little and the weibull model out-play out the Cox model when the distributional supposition that are met and the shape boundary known.

**Introduction:**

Tuberculosis (short for tubercle bacillus), in the past also called phthisis, is a widespread, and in many cases fatal, infectious disease caused by various strains of mycobacterium. It is usually called Mycobacterium tuberculosis. Tuberculosis typically attacks the lungs, but can also affect other parts of the body. It is spread through the air when people who have an active TB infection cough, sneeze, or otherwise transmit respiratory fluids through the air. Most infections do not have symptoms, known as latent tuberculosis. About one in ten latent infections eventually progresses to active disease which, if left untreated, kills more than 50% of those so infected. The classic symptoms of active TB infection are a chronic cough with blood-tinged sputum, fever, night sweats, and weight loss (the latter giving rise to the formerly common term consumption). Infection of other organs causes a wide range of symptoms. Diagnosis of active TB relies on radiology (commonly chest X-rays), as well as microscopic examination and microbiological culture of body fluids. Diagnosis of latent TB relies on the tuberculin skin test (TST) and blood tests. Treatment is difficult and requires administration of multiple antibiotics over a long period of time. Social contacts are also screened and treated if necessary. Antibiotic resistance is a growing problem in multiple drug-resistant tuberculosis (MDR-TB) infections. Prevention relies on screening programs and vaccination with the bacillus Calmette-Guérin vaccine.

A simulation study was done to compare the mean square errors of the Weibull maximum likelihood estimate and the Cox proportional hazards model estimate of β=PH-slope when data come from a Weibull distribution. The data were simulated from a Weibull distribution with survival function S(t)=(e-t2)ex That is, the model is Weibull with β=1 for the slope of the covariate x, shape parameter γ=2, and baseline survival function h0(t)=e-t2. The values of the covariate are x assumed to normally distributed as X~N (N,0,1). The total sample sizes are 15, 45, 90 and 180 with 5, 15, 30 or 60 observations for each value of x. The data were simulated using the fact that the random variable U=F(T) has a uniform distribution where T is a Weibull random variable with cumulative distribution function F(t). For this study, a value of T was obtained at T=(-ln(U)βe-Xβ ) 1 α here U  U(0,1), a=2 is the Weibull shape parameter and β=1 is the Weibull scale parameter. The uniform random variable was generated using the R random number generator. Data were simulated without censoring and with ten percent random censoring. With random censoring a uniform variable U* was generated independently of U and an observation was denoted as censored if U* ≤ 0

**Conclusion:**

In view of the aftereffect of the investigation, the Weibull model is a superior choice for dissecting lifetime information if the distributional suppositions can be met and the shape boundary is known. The mean square blunders are littlest for this situation. In any case, when the shape boundary is obscure for blue-penciled information, the Cox relative perils model is a decent elective. However, for uncensored information when the distributional presumptions are not met and shape boundary obscure, the two models can be utilized conversely. It requires less suppositions than the parametric Weibull model gives similar mean square mistakes of the evaluations of PH-slant. There might be a worry for more modest examples with the Cox corresponding perils model contingent upon the specific informational index being broke down. In this way the shape boundary of the weibull model those not depends or have impact on the presentation of the corresponding danger model.

**Keywords:** Tuberculosis; Survival; Cox proportional hazard model; Weibull model; Parameter