

## Assignment – Event History 4

### Exercise 1

If we assume that those 720 individuals eventually will move from their home until end of follow-up study, the best fit PH Cox model estimates are shown below:

```
Call:
coxph(formula = surv.dat ~ owner + age_20, data = stay)

n= 720, number of events= 478

      coef exp(coef)    se(coef)      z Pr(>|z|)
owner -0.670796  0.511301  0.105937 -6.332 2.42e-10 ***
age_20 -0.029828  0.970613  0.008921 -3.344 0.000827 ***
```

### Problem 1.1

The variables that influence whether people move or stay are: if the person owns his home or not; and age when moving in. The effect of education and the interaction between education and ownership seems to not be significant to the hazard of moving out. While those people who were owners of their homes were found to be less likely to move than non-owners, older persons also were found to be less likely to move than younger persons. Both covariates act in a negative direction, that means that an increase in age when moving in and being a home owner are associated with a lower risk of moving home.

### Problem 1.2

According to the immune fraction model estimates (shown below), the characteristics that influence the hazard of moving out are: if the person owns his home or not; and age when moving in.

```
Cure probability model:
      Estimate Std. Error Z value Pr(>|Z|)
(Intercept)  2.40177801 0.48869052  4.91472195 8.890855e-07
owner        -1.43295979 0.40729613 -3.51822586 4.344424e-04
age_20       -0.05470587 0.01971795 -2.77441964 5.530029e-03
edu_medium   -0.20353638 0.38205106 -0.53274655 5.942090e-01
edu_high     -0.08397596 0.38635559 -0.21735406 8.279324e-01
int1         0.18388483 0.49504005  0.37145445 7.102991e-01
int2        -0.03930994 0.51862115 -0.07579703 9.395806e-01
```

The effect of education and the interaction between education and ownership seems to not be significant to the hazard of moving out. The same as the PH Cox model, being a home owner reduces the hazard of moving out, compared to being not owner and as the age when move in increases, the lower is the risk of moving out, controlling for all other variables in the model.

**If you compare with the original Cox model, are there differences in your conclusions if you allow for an immune fraction of stayers?**

In this particular study, the final conclusion that the covariates being a home ownership and that an increase in age when move in are associated with a lower risk of moving home are the same, using the PH Cox model or the Immune fraction model. Also, education level was not found to have a significant effect in both models. But as we already know, not every person will experience moving home, so the Immune fraction model seems to have a more realistic assumption if compared to PH Cox model.

## Exercise 2

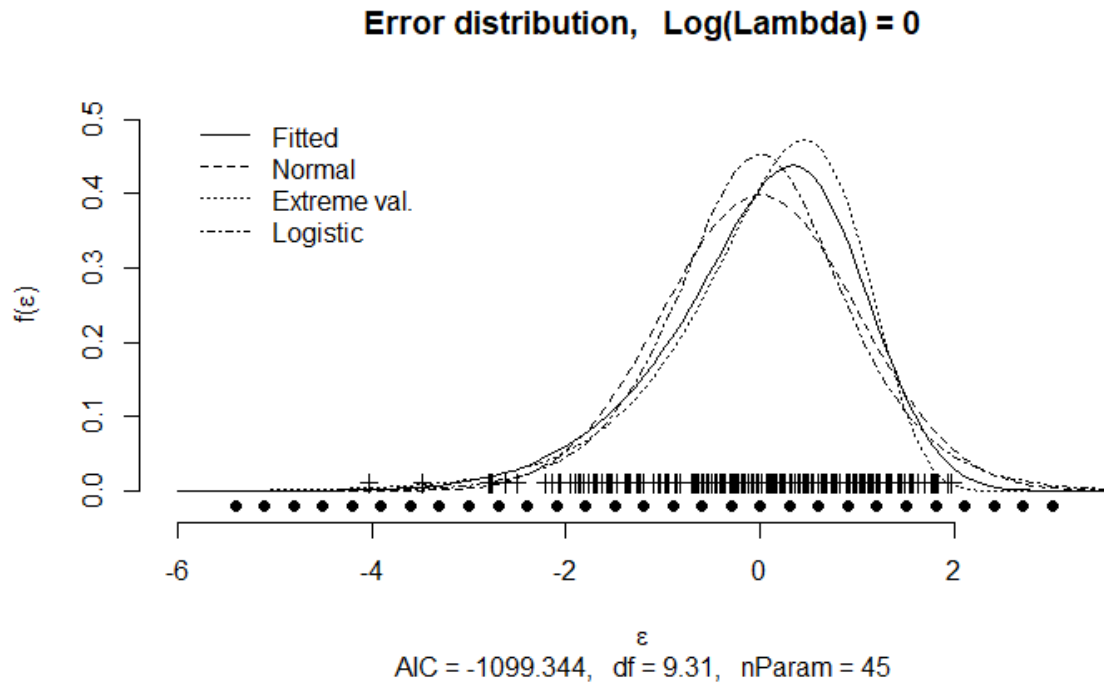
### Problem 2.1

The results of AFT estimated model for the duration of doctoral studies are shown below:

	Value	Std.Error	Std.Error2	Z	Z2	p	p2
(Intercept)	4.15269	0.01505	0.01503	275.856	276.366	0.000e+00	0.000e+00
sexM	0.01509	0.01113	0.01098	1.355	1.374	1.754e-01	1.695e-01
residenceT	-0.21157	0.01035	0.01026	-20.448	-20.622	6.197e-93	1.741e-94
topics	-0.25766	0.01119	0.01109	-23.032	-23.223	2.246e-117	2.651e-119
fieldnat	-0.22854	0.01483	0.01474	-15.408	-15.501	1.457e-53	3.414e-54
fieldsoc	-0.29861	0.01272	0.01269	-23.480	-23.526	6.514e-122	2.214e-122
Log(scale)	-2.25023	0.04053	0.04008	-55.519	-56.142	0.000e+00	0.000e+00

The covariates that have an influence on the duration of doctoral are: Temporary residence (with respect to permanent residence), same or similar topic (with respect to new topic), natural and social sciences or humanities (with respect to engineering). Here we have, when  $\hat{\beta} > 0$ , it has an accelerating effect on the duration of doctoral studies, when  $\hat{\beta} < 0$ , has a decelerating effect on the duration of doctoral studies. So, all these covariates have an accelerating effect on the duration of doctoral studies. The only variable that is not significant for the model is sex.

## Problem 2.2



As we can observe in the graph above, the  $W_0$  distribution is not as closely to the LogNormal as the other distributions (lower compared to the fitted curve and has more variance). Therefore, we can say that the results do not support a LogNormal distribution for the duration of doctoral studies.

## Problem 2.3

According to the model, the group of students that, on average, experience the SHORTEST duration of PhD are those who lives in temporary residence, those who PhD topic is same or similar to previous studies, also, if the PhD thesis is in on natural sciences or social sciences and humanities.

The group of students that, on average, experience the LONGEST duration of PhD are those who lives in a permanent residence, those who has new PhD topic and also those who studies engineering.