Applied Microeconometrics - Assignment 4

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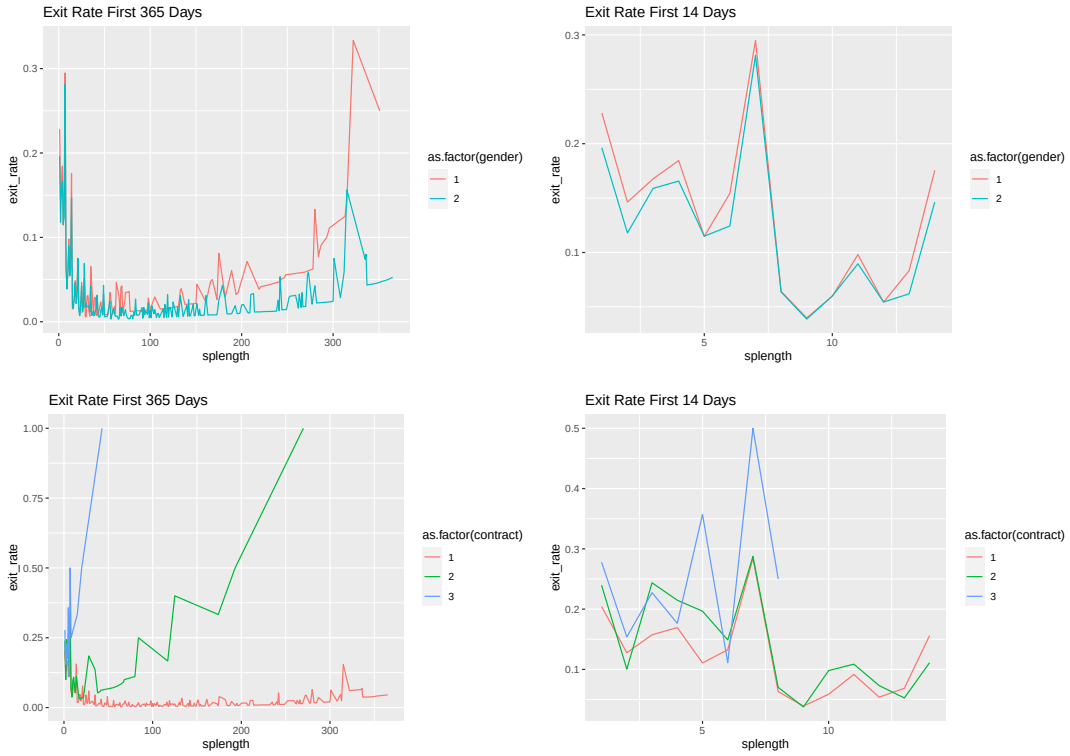
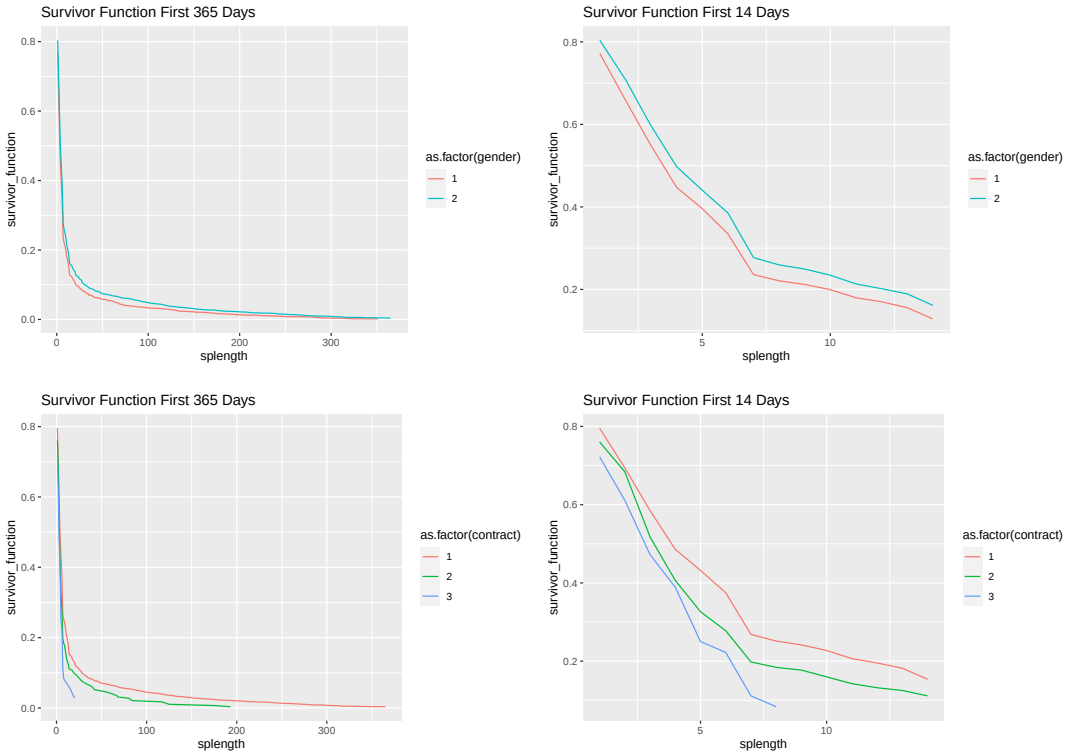
1. Describe the sickness spell data, i.e. do a simple listing of the survivor function and plot the hazard rate and the survivor function. Make separate plots for the first two weeks and for the first year. Also plot the hazard by different subgroups (for instance gender) and test whether the survival curves are the same for the different subgroups.

First, we plot the exit rates:



Then, we plot the survivor functions:



2.1 Estimate a Weibull and an Exponential model for sickness spells. Start with a very simple specification and you only include one regressor and subsequently add more regressors. Comment on the change in the Weibull parameters and the regression parameters when you add more variables to the model. Compare the estimates of both models.

Table 1: Weibull Models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(Intercept)	1.938***	1.795***	2.280***	2.279***	2.334***	0.979*
	(0.127)	(0.195)	(0.213)	(0.213)	(0.251)	(0.530)
gender	0.243***	0.254***	0.273***	0.274***	0.278***	0.319***
	(0.077)	(0.078)	(0.078)	(0.087)	(0.087)	(0.092)
Log(scale)	0.490***	0.490***	0.487***	0.487***	0.486***	0.483***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
marstat		0.069	0.055	0.055	0.049	0.031
		(0.066)	(0.066)	(0.066)	(0.066)	(0.068)
contract			−0.467***	−0.467***	−0.467***	−0.423***
			(0.093)	(0.093)	(0.094)	(0.093)
lowgroup				−0.004	−0.005	−0.020
				(0.079)	(0.079)	(0.080)
classize					0.002	0.002
					(0.005)	(0.005)
schsize					0.000	0.000
					(0.000)	(0.000)
public					−0.056	−0.048
					(0.091)	(0.089)
protest					−0.153	−0.078
					(0.106)	(0.108)
merged						0.005
						(0.013)
avgfem						−0.206
						(0.284)
avgage						0.034***
						(0.011)
avglowgr						0.122
						(0.259)
Num.Obs.	6520	6520	6520	6520	6520	6520
AIC	44 443.9	44 442.6	44 415.1	44 417.1	44 416.8	44 383.2
Log.Lik.	−22 218.934	−22 217.295	−22 202.540	−22 202.537	−22 198.402	−22 177.593

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2: Exponential Models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(Intercept)	2.435***	2.247***	2.852***	2.848***	2.909***	1.601**
	(0.164)	(0.236)	(0.255)	(0.254)	(0.290)	(0.633)
gender	0.267***	0.280***	0.303***	0.324***	0.332***	0.377***
	(0.097)	(0.098)	(0.097)	(0.104)	(0.103)	(0.108)
marstat		0.091	0.077	0.076	0.077	0.058
		(0.080)	(0.079)	(0.079)	(0.078)	(0.080)
contract			−0.594***	−0.595***	−0.600***	−0.537***
			(0.112)	(0.111)	(0.112)	(0.116)
lowgroup				−0.044	−0.043	−0.063
				(0.096)	(0.097)	(0.098)
classize					0.003	0.003
					(0.005)	(0.005)
schsize					0.000	0.000
					(0.000)	(0.000)
public					−0.116	−0.093
					(0.103)	(0.104)
protest					−0.160	−0.083
					(0.124)	(0.128)
merged						−0.004
						(0.015)
avgfem						−0.237
						(0.335)
avgage						0.033***
						(0.012)
avglowgr						0.091
						(0.297)
Num.Obs.	6520	6520	6520	6520	6520	6520
AIC	49 147.6	49 133.1	49 022.5	49 022.1	48 996.4	48 893.8
Log.Lik.	−24 571.812	−24 563.554	−24 507.235	−24 506.073	−24 489.220	−24 433.900

* p < 0.1, ** p < 0.05, *** p < 0.01

2.2 Estimate separate Weibull models for males and females. Comment on the results (is it better to estimate separate models for males and females?) Estimate the Weibull duration model for other subgroups that may differ in their behavior and where the baseline hazard may differ.

First, we estimate a model for males:

Table 3: Weibull Models - Males Only

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(Intercept)	2.204***	2.446***	3.162***	3.149***	3.363***	1.558*
	(0.048)	(0.329)	(0.394)	(0.394)	(0.419)	(0.904)
Log(scale)	0.461***	0.460***	0.458***	0.457***	0.456***	0.449***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
marstat		−0.125	−0.138	−0.138	−0.150	−0.149
		(0.168)	(0.165)	(0.166)	(0.161)	(0.157)
contract			−0.675***	−0.685***	−0.631***	−0.559***
			(0.169)	(0.174)	(0.179)	(0.188)
lowgroup				0.083	0.084	0.094
				(0.122)	(0.122)	(0.123)
classize					−0.009	−0.008
					(0.007)	(0.007)
schsize					0.000	0.000
					(0.000)	(0.000)
public					−0.073	−0.036
					(0.128)	(0.132)
protest					0.009	0.032
					(0.180)	(0.174)
merged						0.035
						(0.028)
avgfem						0.457
						(0.400)
avgage						0.041**
						(0.016)
avglowgr						−0.357
						(0.410)
Num.Obs.	2046	2046	2046	2046	2046	2046
AIC	13 422.3	13 422.4	13 416.2	13 417.1	13 421.4	13 405.4
Log.Lik.	−6709.152	−6708.217	−6704.101	−6703.534	−6701.689	−6689.697

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Next, we estimate a model for females:

Table 4: Weibull Models - Females Only

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
(Intercept)	2.414***	2.228***	2.715***	2.755***	2.763***	1.729***
	(0.042)	(0.138)	(0.174)	(0.197)	(0.260)	(0.643)
Log(scale)	0.503***	0.502***	0.499***	0.499***	0.498***	0.494***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
marstat		0.106	0.093	0.092	0.076	0.058
		(0.074)	(0.074)	(0.074)	(0.073)	(0.076)
contract			−0.435***	−0.435***	−0.433***	−0.393***
			(0.103)	(0.102)	(0.106)	(0.103)
lowgroup				−0.048	−0.038	−0.081
				(0.099)	(0.099)	(0.103)
classize					0.005	0.006
					(0.006)	(0.006)
schsize					0.000	0.000
					(0.000)	(0.000)
public					−0.039	−0.030
					(0.116)	(0.114)
protest					−0.211*	−0.123
					(0.127)	(0.133)
merged						−0.008
						(0.014)
avgfem						−0.557
						(0.383)
avgage						0.030**
						(0.013)
avglowgr						0.403
						(0.334)
Num.Obs.	4474	4474	4474	4474	4474	4474
AIC	31 018.2	31 013.9	30 994.0	30 995.4	30 991.3	30 969.4
Log.Lik.	−15 507.109	−15 503.936	−15 493.017	−15 492.706	−15 486.663	−15 471.686

* p < 0.1, ** p < 0.05, *** p < 0.01

Now, given that under question 1 we observed a difference between the exit rates and the survival functions for the different contract types, we have estimated Weibull models for the contract types. However, our results are difficult to compare. The reason for this is that the models for the temporary and mixed contract have very little observations. Especially, the mixed contract has too little (36 observations). For this reason we can not make an educated comparison for this subgroup.

Table 5: Weibull Models - Models for the all contract types

	Fixed contract	Temporary contract	Mixed contract
	Model 1	Model 2	Model 3
(Intercept)	0.526	0.290	2.377
	(0.523)	(1.742)	(2.100)
marstat	0.019	0.439**	−0.323
	(0.070)	(0.220)	(0.225)
gender	0.304***	0.781**	0.616
	(0.095)	(0.309)	(0.629)
lowgroup	−0.010	−0.083	−0.089
	(0.083)	(0.271)	(0.739)
classize	0.003	0.002	0.008
	(0.005)	(0.009)	(0.035)
schsize	0.000	0.000	0.005*
	(0.000)	(0.001)	(0.003)
public	−0.041	−0.087	−0.464**
	(0.090)	(0.264)	(0.189)
protest	−0.085	0.154	0.367
	(0.108)	(0.372)	(0.522)
merged	0.002	0.056	−0.013
	(0.014)	(0.046)	(0.052)
avgfem	−0.172	−0.796	−1.661*
	(0.285)	(0.934)	(1.003)
avgage	0.035***	−0.013	−0.045
	(0.011)	(0.038)	(0.040)
avglowgr	0.080	0.978	0.581
	(0.262)	(0.820)	(1.867)
Log(scale)	0.490***	0.317***	−0.226*
	(0.014)	(0.050)	(0.127)
Num.Obs.	6196	288	36
AIC	42 336.4	1838.7	202.8
Log.Lik.	−21 155.217	−906.333	−88.386

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

3.1 Estimate a Piece Wise Constant (PWC) model for the entire sample. Use the stsplit command to create multiple record data. You can have as many steps as the data allow you to take, but first start with only a few (3 or 4 steps). Next estimate a model with 15-20 steps, or even more. Plot de duration pattern implied by the estimates and comment on these and the regression parameters. How do the regression parameters (β) compare with those of the Weibull model?

We estimate a piece wise constant.

3.2 Estimate separate models for males and females.

First we estimate a PWC model for males.

Now we estimate the same model for females.

4. Estimate a Cox model and compare the most elaborate specification with the results of the PWC model

Table 6: PWC (Weibull)

	PWC 14 steps	PWC 4 steps
	Model 1	Model 2
(Intercept)	3.060***	3.843***
	(0.189)	(0.532)
marstat	0.007	0.085*
	(0.017)	(0.051)
contract	0.165*	0.343
	(0.099)	(0.250)
merged	0.004	0.003
	(0.006)	(0.014)
lowgroup	−0.019	−0.096
	(0.024)	(0.084)
classize	0.000	−0.001
	(0.001)	(0.003)
schsize	0.000	0.000
	(0.000)	(0.000)
public	0.039	0.013
	(0.027)	(0.092)
protest	0.038	−0.046
	(0.035)	(0.105)
avgfem	−0.100	−0.093
	(0.089)	(0.293)
avgage	0.003	0.002
	(0.003)	(0.009)
avglowgr	0.149*	0.207
	(0.076)	(0.280)

Table 7: PWC (Weibull) - Males only

	PWC 14 steps	PWC 4 steps
	Model 1	Model 2
(Intercept)	−850.507***	−1.016
	(0.322)	(0.958)
marstat	−0.017	0.260**
	(0.060)	(0.130)
contract	853.775***	5.494***
	(0.000)	(0.661)
merged	0.006	0.017
	(0.014)	(0.022)
lowgroup	0.067	−0.082
	(0.045)	(0.097)
classize	0.001	−0.008
	(0.003)	(0.007)
schsize	0.000	0.000
	(0.000)	(0.000)
public	0.075	−0.103
	(0.054)	(0.165)
protest	−0.049	−0.341**
	(0.052)	(0.145)
avgfem	−0.009	−0.445
	(0.190)	(0.457)
avgage	0.003	−0.012
	(0.006)	(0.015)
avglowgr	−0.086	0.172
	(0.180)	(0.338)

Table 8: PWC (Weibull) - Females only

	PWC 14 steps	PWC 4 steps
	Model 1	Model 2
(Intercept)	3.084***	3.780***
	(0.220)	(0.615)
marstat	0.019	0.097*
	(0.019)	(0.059)
contract	0.150	0.309
	(0.099)	(0.251)
merged	0.002	0.001
	(0.007)	(0.019)
lowgroup	−0.073*	−0.172
	(0.038)	(0.125)
classize	−0.001	−0.002
	(0.001)	(0.004)
schsize	0.000	0.000
	(0.000)	(0.000)
public	0.045	0.014
	(0.032)	(0.103)
protest	0.104**	0.137
	(0.045)	(0.143)
avgfem	−0.151	−0.160
	(0.103)	(0.347)
avgage	0.004	0.008
	(0.004)	(0.010)
avglowgr	0.198**	0.226
	(0.086)	(0.326)