

נוגד הפרדוקס - גרמים מס' 4 - פתרון

1. מצולח בסוף הפתרון תשובה של אומץ ק- KM דקדוק
 (ה'כוח כפי שדיבנו אורו בתרשים קונם ודיבור מקדים
 דקדוק דקדוק. מצב מקדמים

$$\hat{S}_0(60) = \hat{S}_0(54) = 0.4091, \quad \widehat{Var}(\hat{S}_0(60))^{1/2} = 0.1048$$

$$\hat{S}_1(60) = \hat{S}_1(54) = 0.8182, \quad \widehat{Var}(\hat{S}_1(60))^{1/2} = 0.0822$$

ומצב בונים אור קט' (ט')

$$z = (0.8182 - 0.4091) / [(0.1048)^2 + (0.0822)^2]^{1/2}$$

$$= 0.4091 / 0.1332 = 3.07$$

2. תשובה דקדוק (ה' יפוס):

$T_{(k)}$	D_k	$R(T_{(k)})$	$\hat{S}(T_{(k)})$	מלצמ אר
0	0	22	0.1	0
2	1	22	0.9545	$\delta^{(1)} + (2-0)(0.1) = 2$
6	1	21	0.9091	$\delta^{(2)} + (6-2)(0.9545) = 5.8180$
12	1	20	0.8636	$\delta^{(3)} + (12-6)(0.9091) = 11.2726$
54	1	19	0.8182	$\delta^{(4)} + (54-12)(0.8636) = 47.5438$
$\tau^* = 60$				$\delta^{(5)} + (60-54)(0.8182) = 52.4530$

$$\hat{A}_1 = 52.45$$

$$\widehat{Var}(\hat{A}_1) = \frac{22}{21} \times \left[\frac{(52.4530 - 2)^2}{22 \times 21} + \frac{(52.4530 - 5.8180)^2}{21 \times 20} \right.$$

$$+ \frac{(52.4530 - 11.2726)^2}{20 \times 19} + \left. \frac{(52.4530 - 47.5438)^2}{19 \times 18} \right]$$

$$= 15.95$$

תורת אינדיקציה

$T_{(k)}$	$D_{(k)}$	$R(T_{(k)})$	$\hat{S}(T_{(k)})$	$\delta_k^*(3N, n)(e)$
0	0	22	1	0
2	1	22	0.9545	$\delta_1^*(7) + (2-0)(1) = 2$
3	1	21	0.9091	$\delta_2^*(7) + (3-2)(0.9545) = 2.9545$
4	1	20	0.8636	$\delta_3^*(7) + (4-3)(0.9091) = 3.8636$
7	1	19	0.8182	$\delta_4^*(7) + (7-4)(0.8636) = 6.4544$
10	1	18	0.7727	$\delta_5^*(7) + (10-7)(0.8182) = 8.9090$
22	1	17	0.7273	$\delta_6^*(7) + (22-10)(0.7727) = 18.1814$
28	1	16	0.6818	$\delta_7^*(7) + (28-22)(0.7273) = 22.5452$
29	1	15	0.6364	$\delta_8^*(7) + (29-28)(0.6818) = 23.2270$
32	1	14	0.5909	$\delta_9^*(7) + (32-29)(0.6364) = 25.1362$
37	1	13	0.5455	$\delta_{10}^*(7) + (37-32)(0.5909) = 28.0907$
40	1	12	0.5000	$\delta_{11}^*(7) + (40-37)(0.5455) = 29.7272$
41	1	11	0.4545	$\delta_{12}^*(7) + (41-40)(0.5000) = 30.2272$
54	1	10	0.4091	$\delta_{13}^*(7) + (54-41)(0.4545) = 36.1357$
$\tau^* = 60$				$\delta_{14}^*(7) + (60-54)(0.4091) = 38.5903$

$$\hat{A}_0 = 38.59$$

$$\hat{\text{var}}(\hat{A}_0) = \frac{22}{21} \left[\frac{(38.5903 - 2)^2}{22 \times 21} + \frac{(38.5903 - 2.9545)^2}{21 \times 20} + \frac{(38.5903 - 3.8636)^2}{20 \times 21} + \dots + \frac{(38.5903 - 36.1357)^2}{10 \times 9} \right]$$

$$= 22.75$$

$$Z = (52.45 - 38.59) / [22.75 + 15.95]^{1/2} = 2.23$$

3. צרוק מדגב אה $\max (\hat{\Lambda}_0(t) - \hat{\Lambda}_1(t))$

$\max | \hat{\Lambda}_0(t) - \hat{\Lambda}_1(t) |$

(משמש ב- $\hat{\Lambda}_i(t) = -\log \hat{S}_i(t)$ עם סמך אומדי ה- KM.

גב אפשר דעבור עם אומדי ה- NA.)

דמשפה, יש שניו בפורקציוו $\hat{\Lambda}_i(t)$ רק בקצווו קבן

יש אירוט באגה מדקבוצו. לכן, כדי דמצוא אה

דמקסימום הני"ס, צרוק דהיטובל רק בקצווו קבן

יש אירוט. ובכן נצרוק דמז עזר בצורק הדיאק:

t	$\hat{\Lambda}_0(t)$	$\hat{\Lambda}_1(t)$	$\Lambda_0(t) - \Lambda_1(t)$
2	0.04657	0.04657	0
3	0.09530	0.04657	0.04873
4	0.1466	0.04657	0.1000
6	0.1466	0.09530	0.0513
7	0.2006		0.1053
10	0.2579	0.09530	0.1626
12	0.2579	0.1466	0.1113
22	0.3184		·
28	0.3830		· הפער
29	0.4519		· דוג
32	0.5261		·
37	0.6061		·
40	0.6931		·
41	0.7886	0.1466	0.6420
54	0.8938	0.2006	0.6932
61	1.0117		0.8111
63	1.1451	0.2006	0.9445
68	1.1451	0.2612	0.8839
71	1.2994	0.2612	1.0382
89	1.2994	0.3259	· הפער
96	1.2994	0.4689	· דן
143	1.2994	0.6024	·
146	1.2994	0.7848	·
168	1.2994	1.1904	0.1090

כאן דהפער הכי הגדול (ואג דהפער הכי הגדול בערך מוגד)

הפער דן

אם נתון $\tau = 181$ (משך האחרון שיש בו דם) (כ"ס)

דבר (כ"ס) (כ"ס)

$$\widehat{\text{Var}}(\hat{\lambda}_0(\tau)) = 0.2461$$

(כ"ס) (כ"ס)

$$\widehat{\text{Var}}(\hat{\lambda}_1(\tau)) = 0.1214$$

כ"ס (כ"ס) (כ"ס)

$$1.6382 / [0.2461 + 0.1214]^{1/2} = 1.7125$$

כ"ס (כ"ס) (כ"ס)

$$p\text{-value} = 2(1 - \Phi(1.7125))$$

$$= 0.086$$

כ"ס (כ"ס) (כ"ס) : כ"ס (כ"ס) (כ"ס)

$$0.15 \leq p\text{-value} \leq 0.20$$

כ"ס (כ"ס) (כ"ס) .4

$$\hat{\lambda} = (\sum_i \delta_i) / (\sum_i x_i)$$

$$\widehat{\text{Var}}(\hat{\lambda}) = (\sum_i \delta_i) / (\sum_i x_i)^2 = \hat{\lambda}^2 / \sum_i \delta_i$$

$$\hat{\lambda}_1 = \frac{11}{2410} = 0.004564$$

כ"ס

$$\widehat{\text{Var}}(\hat{\lambda}_1) = \frac{(11/2410)^2}{11} = 1.894 \times 10^{-6}$$

$$\hat{\lambda}_0 = \frac{16}{1424} = 0.01124$$

$$\widehat{\text{Var}}(\hat{\lambda}_0) = \frac{(16/1424)^2}{16} = 7.890 \times 10^{-6}$$

$$z = (\hat{\lambda}_0 - \hat{\lambda}_1) / [\widehat{\text{Var}}(\hat{\lambda}_0) + \widehat{\text{Var}}(\hat{\lambda}_1)]^{1/2} = 2.13$$

אורך זמן קצב (מספר אירועים קצב) δ קצב

702

$T_{(k)}$	$D_{(k)}$	$R(T_{(k)})$	$\hat{S}(T_{(k)})$
0	0	22	1
2	1	22	$\delta^n \times (1 - \frac{1}{22}) = 0.9545$
6	1	21	$\delta^n \times (1 - \frac{1}{21}) = 0.9091$
12	1	20	$\delta^n \times (1 - \frac{1}{20}) = 0.8636$
54	1	19	$\delta^n \times (1 - \frac{1}{19}) = 0.8182$
68	1	17	$\delta^n \times (1 - \frac{1}{17}) = 0.7701$
89	1	16	$\delta^n \times (1 - \frac{1}{16}) = 0.7219$
96	2	15	$\delta^n \times (1 - \frac{2}{15}) = 0.6257$
143	1	8	$\delta^n \times (1 - \frac{1}{8}) = 0.5475$
146	1	6	$\delta^n \times (1 - \frac{1}{6}) = 0.4562$
168	1	3	$\delta^n \times (1 - \frac{1}{3}) = 0.3041$

האירועים
האירועים
האירועים
האירועים
האירועים

: Greenwood \rightarrow \ln

$$\text{Var}(\hat{S}(t)) = \hat{S}(t)^2 V(t)$$

$$V(t) = \sum_{k: T_{(k)} \leq t} \frac{d_k}{R(T_{(k)})(R(T_{(k)}) - d_k)}$$

זהו

$T_{(k)}$	$V(T_{(k)})$	$\sqrt{\text{Var}(\hat{S}(t))} = \hat{S}(t) \sqrt{V(t)}$
2	$\frac{1}{22 \times 21} = 0.002165$	0.0444
6	$\delta^n + \frac{1}{21 \times 20} = 0.004545$	0.06129
12	$\delta^n + \frac{1}{20 \times 19} = 0.007177$	0.07316
54	$\delta^n + \frac{1}{19 \times 18} = 0.010101$	0.08223
68	$\delta^n + \frac{1}{17 \times 16} = 0.01378$	0.09039
89	$\delta^n + \frac{1}{16 \times 15} = 0.01794$	0.09670
96	$\delta^n + \frac{2}{15 \times 13} = 0.02820$	0.1051
143	$\delta^n + \frac{1}{8 \times 7} = 0.04606$	0.1175
146	$\delta^n + \frac{1}{6 \times 5} = 0.07939$	0.1285
168	$\delta^n + \frac{1}{3 \times 2} = 0.2461$	0.1508

ישו של העולם הנכבד
האנשים הנכבדים
הנכבדים הנכבדים

בדגושה הקדחה: מכיון שאין בנורה קלאס $[0, 60]$
 ניתן למדוד את $S_0(60) - 1$ $\text{Var}(\hat{S}_0(60))$ ע"י נוסחאות
 הפשוטות השייכות לניתוח פרופורציות:

$$\hat{S}_0(60) = 9/22 = 0.4091$$

$$\hat{\text{Var}}(\hat{S}_0(60)) = (0.4091)(1-0.4091)/22 = 0.0199$$

$$\hat{\text{Var}}(\hat{S}_0(60))^{1/2} = 0.1048$$

$$\hat{S}_0(181) = \hat{S}_0(71) = 0.2727 \quad \text{כמו כן}$$

$$\hat{\text{Var}}(\hat{S}_0(181)) = (0.2727)(1-0.2727)/22 = 0.00902$$

$$\begin{aligned} \hat{\text{Var}}(\hat{\lambda}_0(181)) &= \hat{\text{Var}}(\hat{S}_0(181)) / \hat{S}_0(181)^2 \\ &= 0.00902 / (0.2727)^2 = 0.1212 \end{aligned}$$

```
options ls=80 nocenter nodate;
```

```
data indat;
```

```
input group status time;
```

```
* group: 1=drug, 0=placebo;
```

```
* status: 1=death, 0=censoring;
```

```
cards;
```

```
0 1 2
```

```
0 1 3
```

```
0 1 4
```

```
0 1 7
```

```
0 1 10
```

```
0 1 22
```

```
0 1 28
```

```
0 1 29
```

```
0 1 32
```

```
0 1 37
```

```
0 1 40
```

```
0 1 41
```

```
0 1 54
```

```
0 1 61
```

```
0 1 63
```

```
0 1 71
```

```
0 0 127
```

```
0 0 140
```

```
0 0 146
```

```
0 0 158
```

```
0 0 167
```

```
0 0 182
```

```
1 1 2
```

```
1 1 6
```

```
1 1 12
```

```
1 1 54
```

```
1 0 56
```

```
1 1 68
```

```
1 1 89
```

```
1 1 96
```

```
1 1 96
```

```
1 0 125
```

```
1 0 128
```

```
1 0 131
```

```
1 0 140
```

```
1 0 141
```

```
1 1 143
```

```
1 0 145
```

```
1 1 146
```

```
1 0 148
```

```
1 0 162
```

```
1 1 168
```

```
1 0 173
```

```
1 0 181
```

```
;
```

```
proc lifetest outsurv=odat;  
  by group;  
  time time*status(0);
```

```
data dat2;  
set indat;  
if time ge 60 then do;  
  time = 60;  
  status = 1; end;
```

```
proc lifetest intervals=60; by group; time time*status(0);
```


GROUP=0

The LIFETEST Procedure

Product-Limit Survival Estimates

TIME	Survival	Failure	Survival Standard Error	Number Failed	Number Left
0.000	1.0000	0	0	0	22
2.000	0.9545	0.0455	0.0444	1	21
3.000	0.9091	0.0909	0.0613	2	20
4.000	0.8636	0.1364	0.0732	3	19
7.000	0.8182	0.1818	0.0822	4	18
10.000	0.7727	0.2273	0.0893	5	17
22.000	0.7273	0.2727	0.0950	6	16
28.000	0.6818	0.3182	0.0993	7	15
29.000	0.6364	0.3636	0.1026	8	14
32.000	0.5909	0.4091	0.1048	9	13
37.000	0.5455	0.4545	0.1062	10	12
40.000	0.5000	0.5000	0.1066	11	11
41.000	0.4545	0.5455	0.1062	12	10
54.000	0.4091	0.5909	0.1048	13	9
61.000	0.3636	0.6364	0.1026	14	8
63.000	0.3182	0.6818	0.0993	15	7
71.000	0.2727	0.7273	0.0950	16	6
127.000*	.	.	.	16	5
140.000*	.	.	.	16	4
146.000*	.	.	.	16	3
158.000*	.	.	.	16	2
167.000*	.	.	.	16	1
182.000*	.	.	.	16	0

* Censored Observation

Summary Statistics for Time Variable TIME

Quantile	Point Estimate	95% Confidence Interval [Lower, Upper)	
75%	.	41.000	.
50%	40.500	28.000	71.000
25%	22.000	4.000	40.000
Mean	42.273	Standard Error	5.661

NOTE: The last observation was censored so the estimate of the mean is biased.

Summary of the Number of Censored and Uncensored Values

Total	Failed	Censored	%Censored
22	16	6	27.2727

GROUP=1

The LIFETEST Procedure

Product-Limit Survival Estimates

TIME	Survival	Failure	Survival Standard Error	Number Failed	Number Left
0.000	1.0000	0	0	0	22
2.000	22 0.9545	0.0455	0.0444	1	21
6.000	21 0.9091	0.0909	0.0613	2	20
12.000	20 0.8636	0.1364	0.0732	3	19
54.000	19 0.8182	0.1818	0.0822	4	18
56.000*	18 .	.	.	4	17
68.000	17 0.7701	0.2299	0.0904	5	16
89.000	16 0.7219	0.2781	0.0967	6	15
96.000	15 .	.	.	7	14
96.000	14 0.6257	0.3743	0.1051	8	13
125.000*	.	.	.	8	12
128.000*	.	.	.	8	11
131.000*	.	.	.	8	10
140.000*	.	.	.	8	9
141.000*	.	.	.	8	8
143.000	4 0.5475	0.4525	0.1175	9	7
145.000*	.	.	.	9	6
146.000	6 0.4562	0.5438	0.1285	10	5
148.000*	.	.	.	10	4
162.000*	.	.	.	10	3
168.000	3 0.3041	0.6959	0.1509	11	2
173.000*	.	.	.	11	1
181.000*	.	.	.	11	0

* Censored Observation

Summary Statistics for Time Variable TIME

Quantile	Point Estimate	95% Confidence Interval [Lower, Upper)	
75%	.	146.000	.
50%	146.000	96.000	.
25%	89.000	12.000	146.000
Mean	121.310	Standard Error	13.125

NOTE: The last observation was censored so the estimate of the mean is biased.

Summary of the Number of Censored and Uncensored Values

Total	Failed	Censored	%Censored
22	11	11	50.0000