

FORELESNING 3

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TMA4275 LEVETIDSANALYSE

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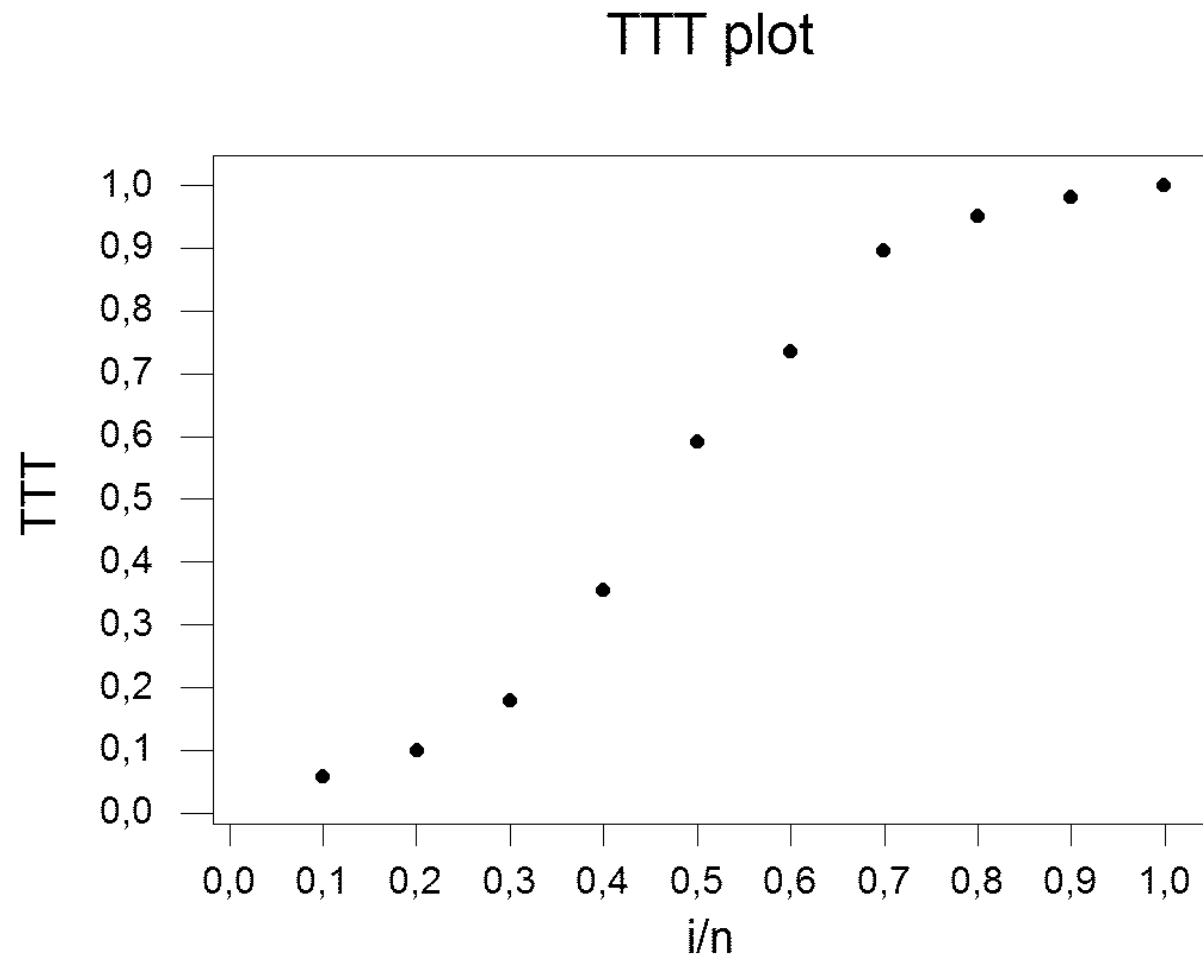
TTT-plott

See Table 9.1 in H&R.

Complete (i.e. uncensored) data.

Row	Time	Cum Time	Tot Time	i/n	TTT
1	6,3	6,3	63,0	0,1	0,05943
2	11,0	17,3	105,3	0,2	0,09934
3	21,5	38,8	189,3	0,3	0,17858
4	48,4	87,2	377,6	0,4	0,35623
5	90,1	177,3	627,8	0,5	0,59226
6	120,2	297,5	778,3	0,6	0,73425
7	163,0	460,5	949,5	0,7	0,89575
8	182,5	643,0	1008,0	0,8	0,95094
9	198,0	841,0	1039,0	0,9	0,98019
10	219,0	1060,0	1060,0	1,0	1,00000

TTT-plot (Data from Table 9.1)

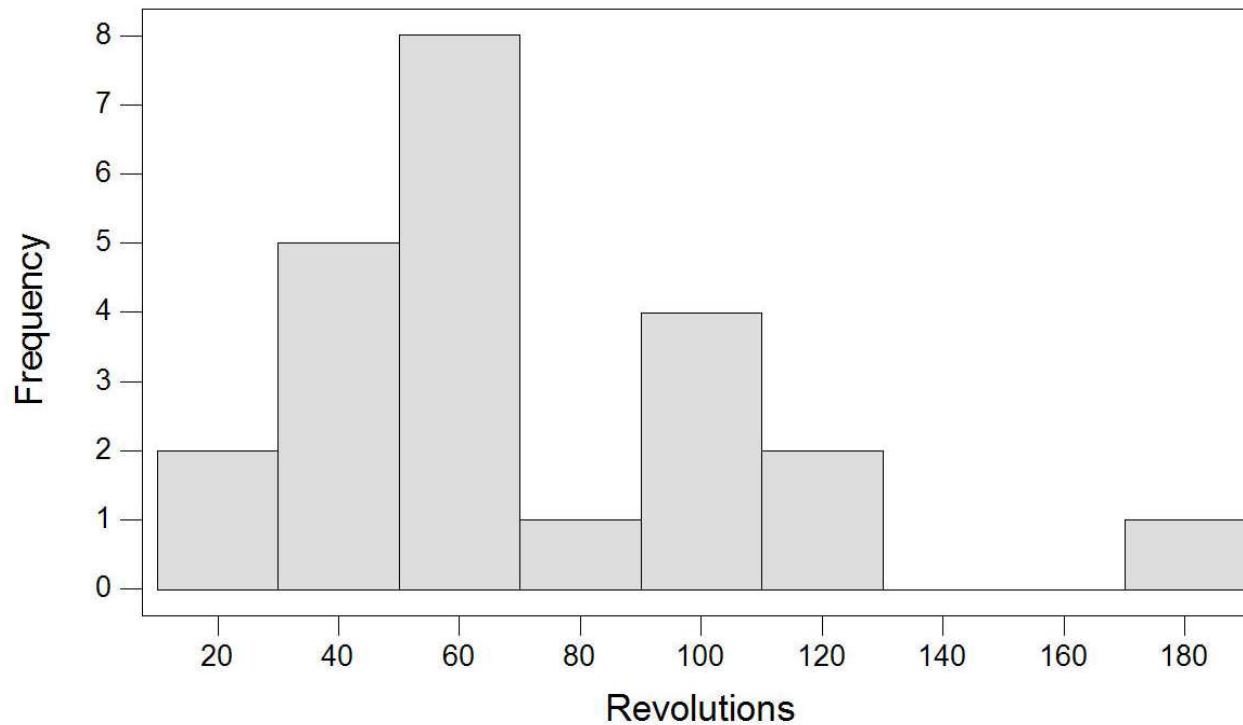


BALL BEARINGS FAILURE DATA

Data: Millions of revolutions to fatigue failure for 23 units

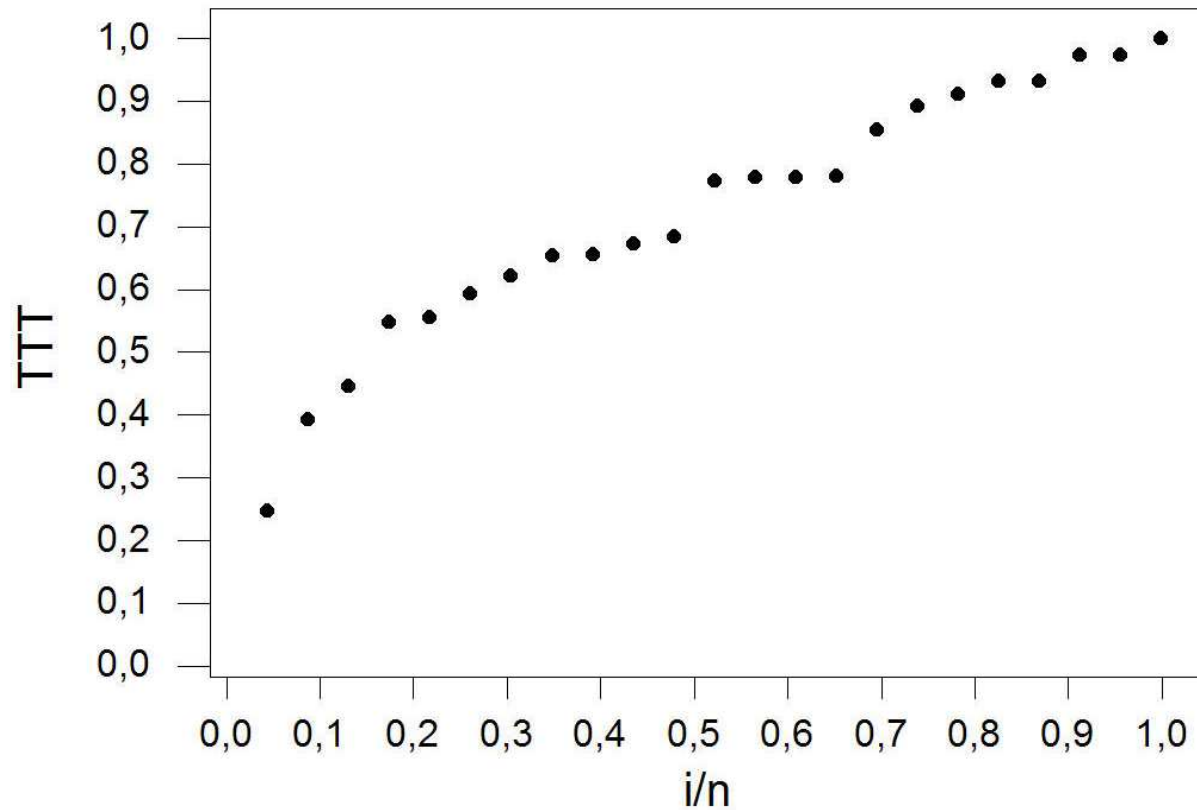
17,88	28,92	33,00	41,52	42,12	45,60	48,40	51,84
51,96	54,12	55,56	67,80	68,64	68,64	68,88	84,12
93,12	98,64	105,12	105,84	127,92	128,04	173,40	

Histogram of Revolutions



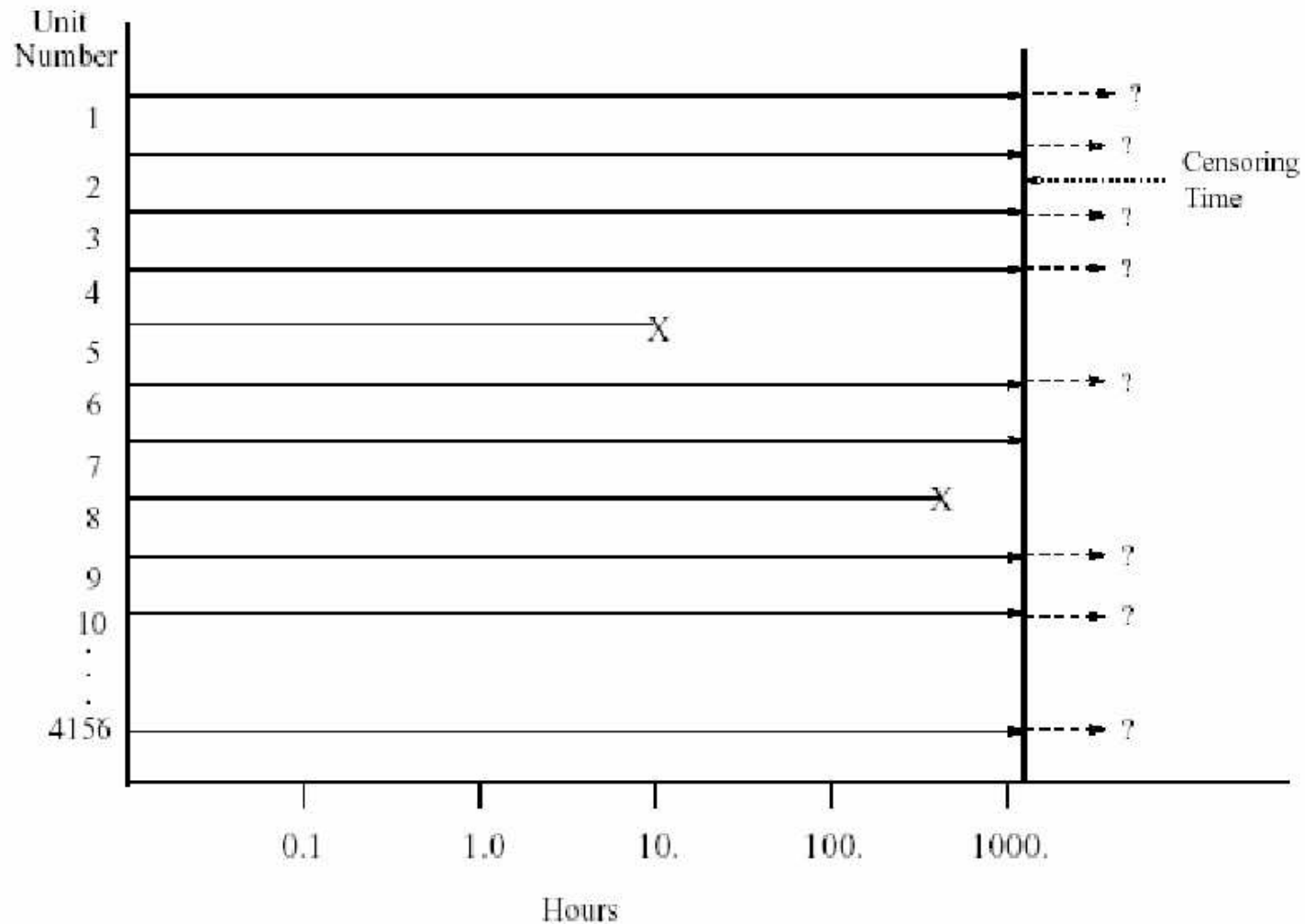
BALL BEARINGS FAILURE DATA

TTT plot



EXAMPLE: CENSORING

IC Data Failure Pattern



Example of Censoring: Leukemia Data

Remission times for 42 children with acute leukemia (free of symptoms).

PL=Placebo, MP=6MP treatment, Y=time, C=censoring (0 means censored)

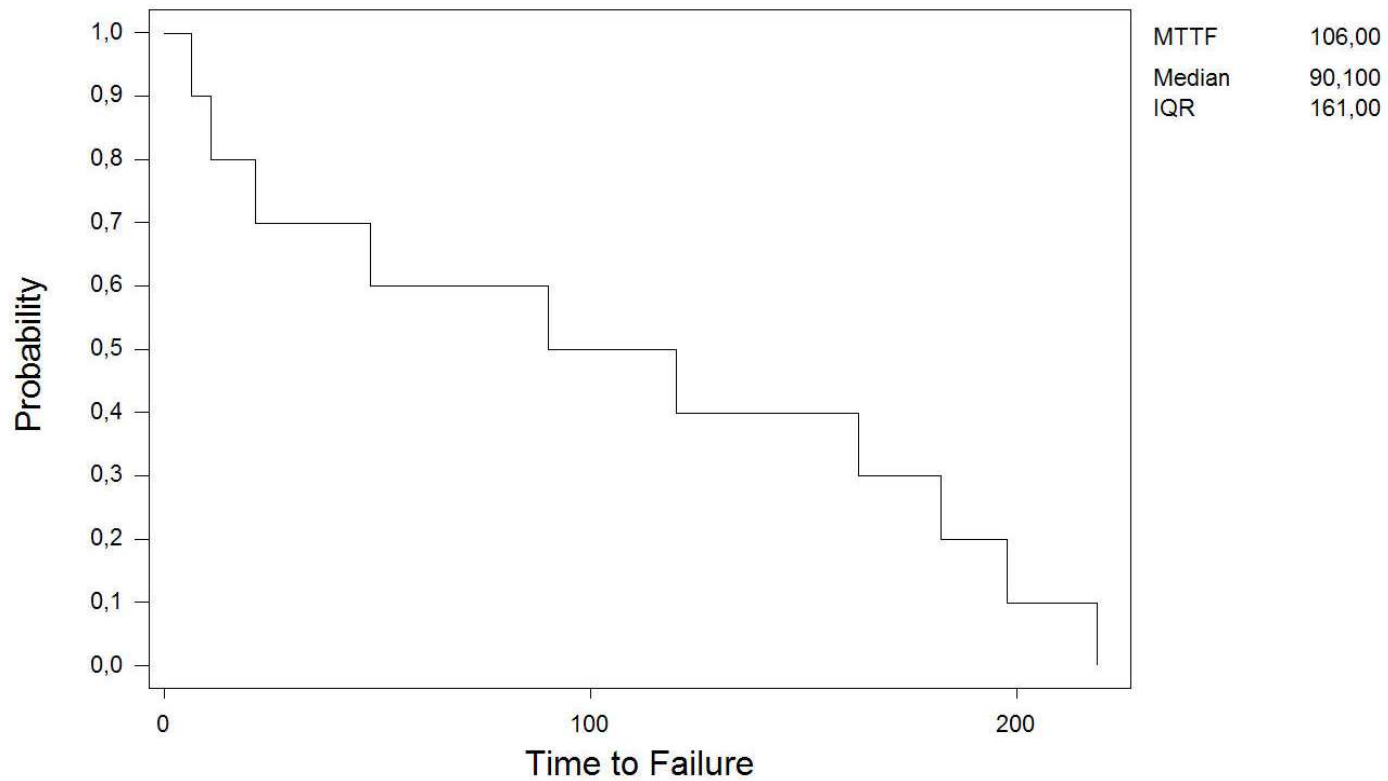
Row	YPL	CPL	YMP	CMP
1	1	1	6	1
2	1	1	6	1
3	2	1	6	1
4	2	1	6	0
5	3	1	7	1
6	4	1	9	0
7	4	1	10	1
8	5	1	10	0
9	5	1	11	0
10	8	1	13	1
11	8	1	16	1
12	8	1	17	0
13	8	1	19	0
14	11	1	20	0
15	11	1	22	1
16	12	1	23	1
17	12	1	25	0
18	15	1	32	0
19	17	1	32	0
20	22	1	34	0
21	23	1	35	0

KM-PLOT WITH COMPLETE DATA (Example 9.1)

Nonparametric Survival Plot for C1

Kaplan-Meier Method

Complete Data

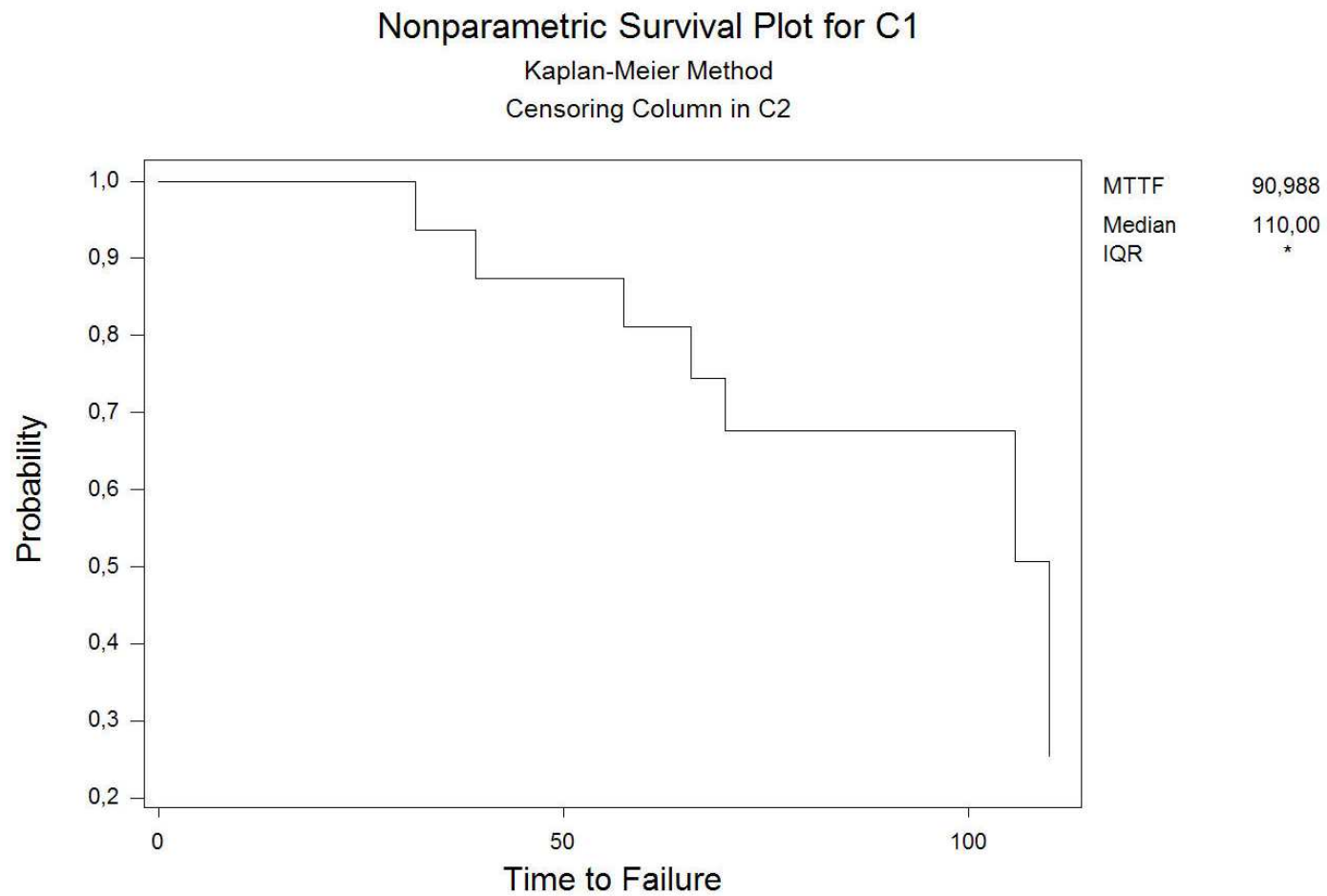


KM-ESTIMATOR WITH CENSORED DATA - Example 9.3

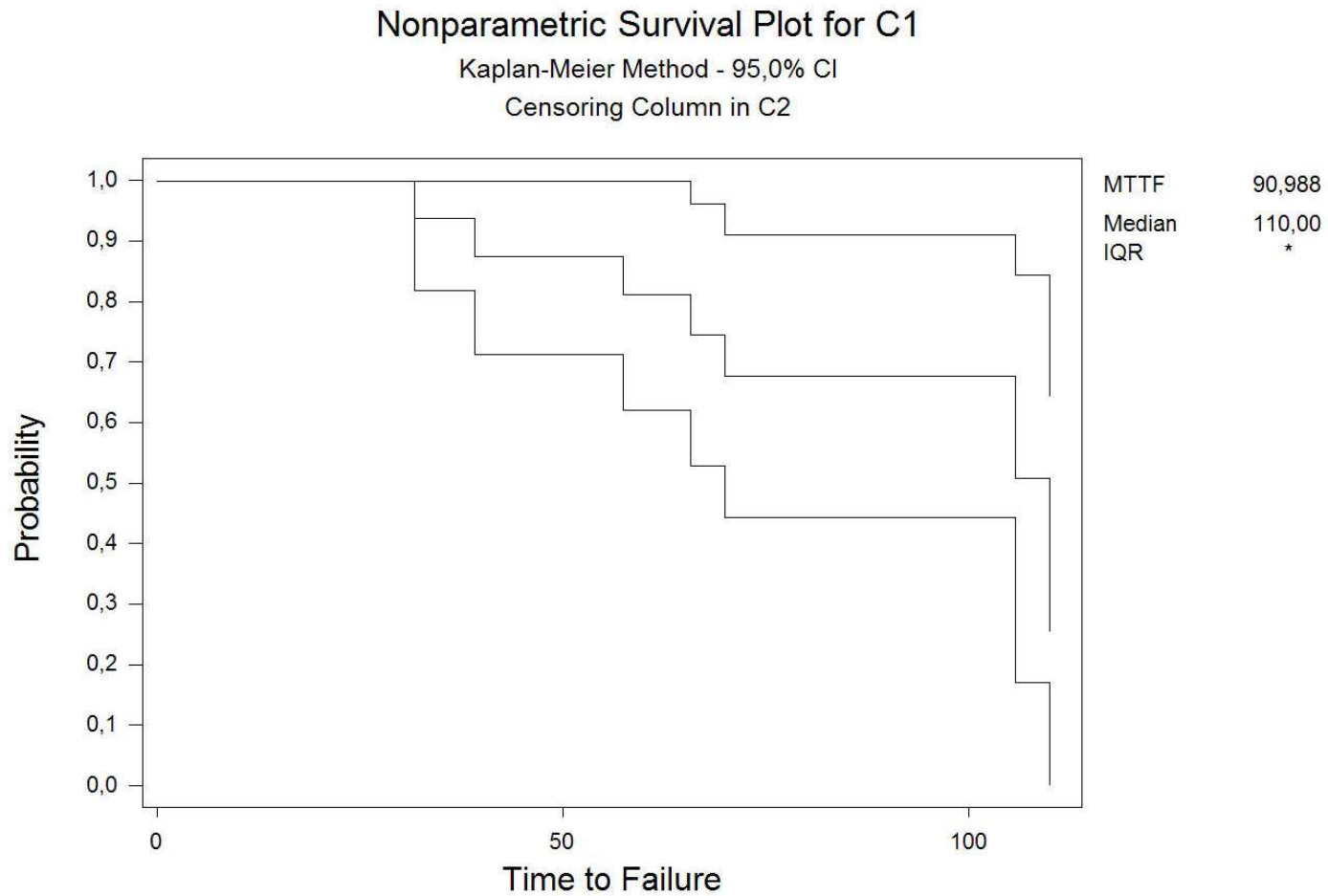
Row	C1	C2
1	31,7	1
2	39,2	1
3	57,5	1
4	65,0	0
5	65,8	1
6	70,0	1
7	75,0	0
8	75,2	0
9	87,5	0
10	88,3	0
11	94,2	0
12	101,7	0
13	105,8	1
14	109,2	0
15	110,0	1
16	130,0	0

Time	Number at Risk	Number Failed	Survival Probability	Standard Error	95,0% Normal CI Lower	Upper
31,7000	16	1	0,9375	0,0605	0,8189	1,0000
39,2000	15	1	0,8750	0,0827	0,7130	1,0000
57,5000	14	1	0,8125	0,0976	0,6213	1,0000
65,8000	12	1	0,7448	0,1105	0,5283	0,9613
70,0000	11	1	0,6771	0,1194	0,4431	0,9111
105,8000	4	1	0,5078	0,1718	0,1711	0,8445
110,0000	2	1	0,2539	0,1990	0,0000	0,6440

KM-plot (Example 9.3)



KM-plot with confidence limits (Example 9.3)



Leukemia Data

Remission times for 42 children with acute leukemia (free of symptoms).

PL=Placebo, MP=6MP treatment, Y=time, C=censoring (0 means censored)

Row	YPL	CPL	YMP	CMP
1	1	1	6	1
2	1	1	6	1
3	2	1	6	1
4	2	1	6	0
5	3	1	7	1
6	4	1	9	0
7	4	1	10	1
8	5	1	10	0
9	5	1	11	0
10	8	1	13	1
11	8	1	16	1
12	8	1	17	0
13	8	1	19	0
14	11	1	20	0
15	11	1	22	1
16	12	1	23	1
17	12	1	25	0
18	15	1	32	0
19	17	1	32	0
20	22	1	34	0
21	23	1	35	0

Kaplan-Meier Estimator – Leukemia Data

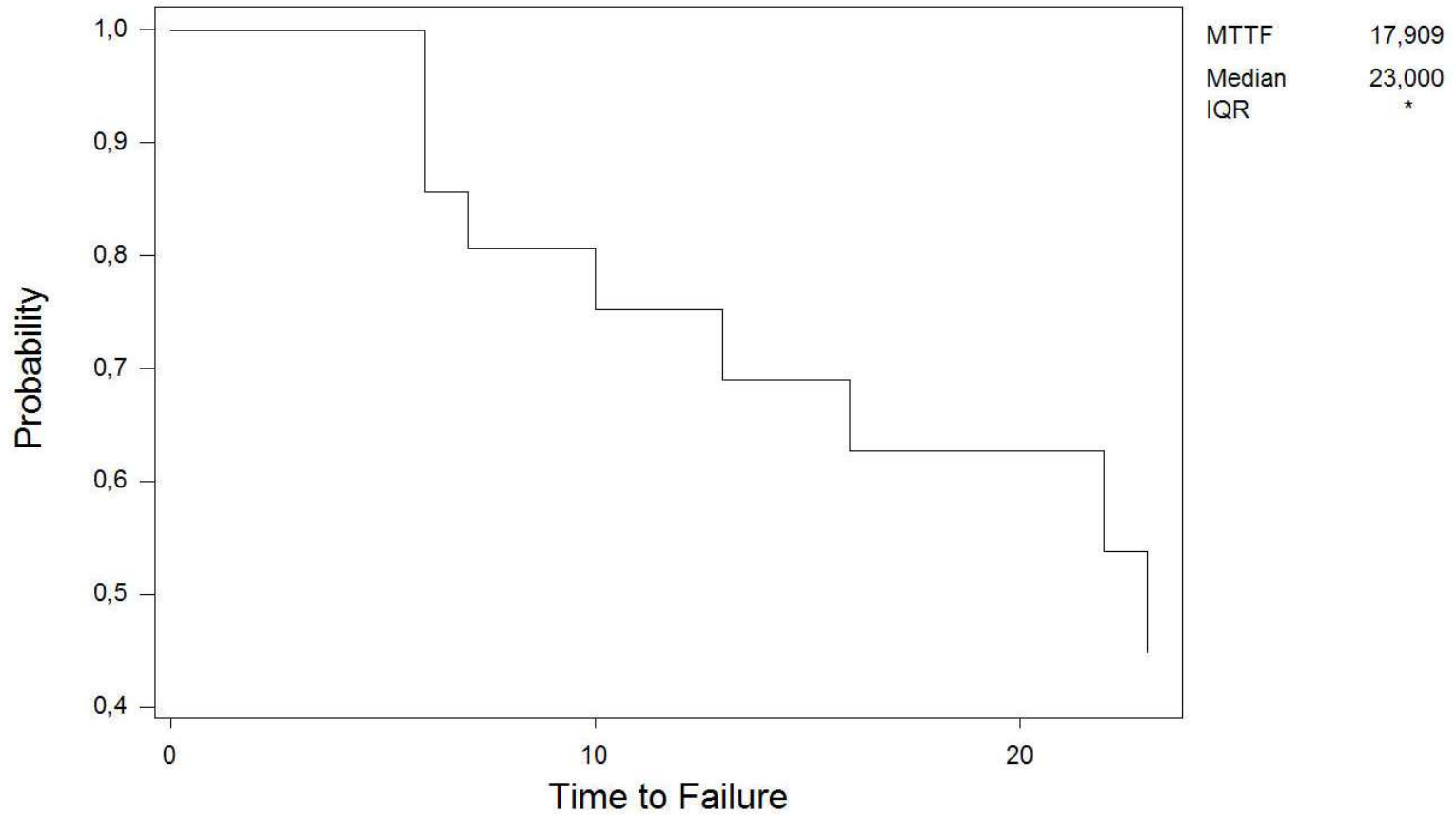
Treatment group (6MP)

Time	Number at Risk	Number Failed	Survival Probability	Standard Error	95,0% Lower	Normal CI Upper
6,0000	21	3	0,8571	0,0764	0,7075	1,0000
7,0000	17	1	0,8067	0,0869	0,6363	0,9771
10,0000	15	1	0,7529	0,0963	0,5641	0,9418
13,0000	12	1	0,6902	0,1068	0,4808	0,8995
16,0000	11	1	0,6275	0,1141	0,4039	0,8510
22,0000	7	1	0,5378	0,1282	0,2865	0,7891
23,0000	6	1	0,4482	0,1346	0,1844	0,7120

KM-plot: Leukemia Data (Treatment group)

Nonparametric Survival Plot for TMP

Kaplan-Meier Method
Censoring Column in CMP



NELSON ESTIMATOR

Data from Example 9.3

Row	Time	Numb at risk	1/Numb at risk	Cum Haz Nelson	Survival Nelson
1	31,7	16	0,062500	0,06250	0,939413
2	39,2	15	0,066667	0,12917	0,878827
3	57,5	14	0,071429	0,20060	0,818244
4	65,8	12	0,083333	0,28393	0,752820
5	70,0	11	0,090909	0,37484	0,687401
6	105,8	4	0,250000	0,62484	0,535348
7	110,0	2	0,500000	1,12484	0,324705

Survival KM					
0,937500	0,875000	0,812500	0,744792	0,677083	0,507813
0,253906					

Nelson-plot: Example 9.3.

Nelson Plot

