

Survival Analysis (Analisis Ketahanan)

DISUSUN OLEH:

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Survival Analysis

Analisis survival (analisis Ketahanan) adalah prosedur statistika untuk menganalisis data dengan waktu sampai terjadinya suatu peristiwa tertentu (*time until an event occurs*) sebagai variabel respons.

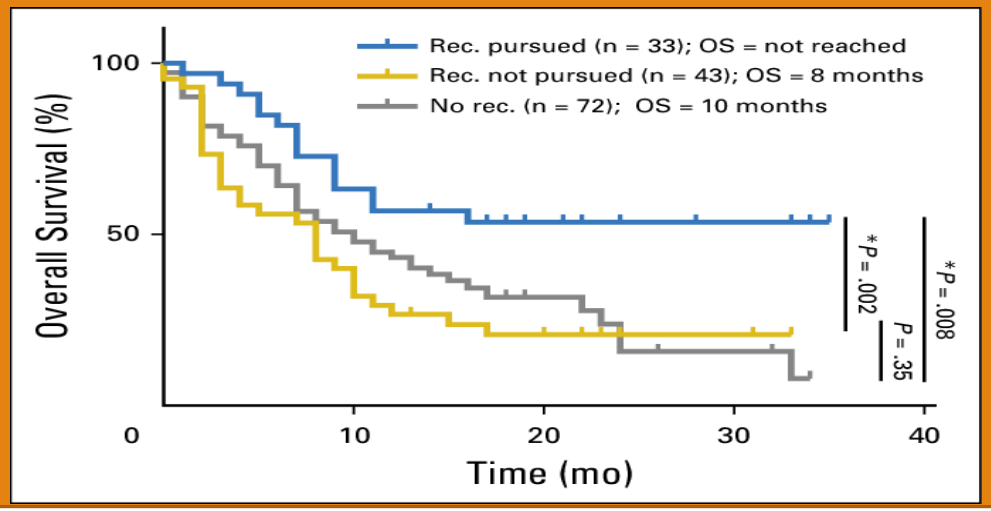
Dalam ilmu Statistik banyak Hal yang diukur dengan satuan waktu, baik tahun, bulan, menit, bahkan detik. Satuan waktu ini biasanya digunakan untuk mengukur suatu kejadian dalam jangka waktu tertentu, ie:

1. Efektifitas Obat dalam jangka waktu tertentu
2. Pengamatan kepuasan konsumen untuk program promo dalam waktu sebulan
3. Efektifitas iklan yang ditayangkan dalam beberapa waktu

Tujuan Survival Analysis

Beberapa Tujuan dari Survival Analysis

1. Memperkirakan probabilitas ketahanan sebuah kejadian menurut waktu
2. Membandingkan ketahanan antar kelompok



Dalam Praktek survival test banyak digunakan dalam bidang

1. Kedokteran (mengetahui efektifitas obat, ketahanan pasien terhadap penyakit tertentu dan lainnya
2. Asuransi seperti kemungkinan pembayaran premi, penentuan besar premi dan lainnya
3. Bidang Bisnis untuk mengukur bebagai aktivitas kejadian yang berbasis waktu, missal: mengukur keberhasilan program member card untuk menarik pelanggan

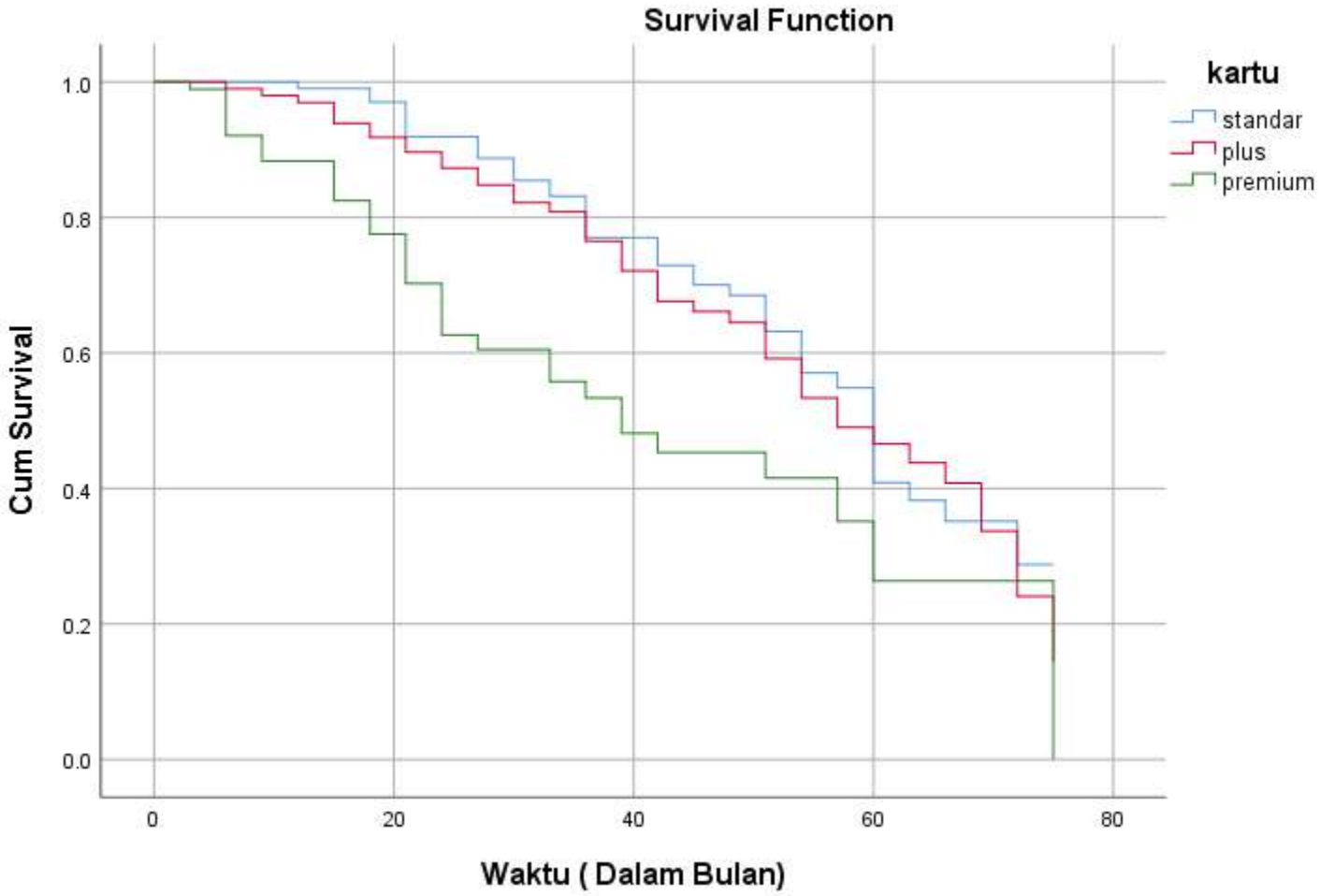
Prinsip Dasar Survival Analysis

WAKTU

EVENT

SENSOR

HASIL ANALIS SURVIVAL



Studi KASUS

Untuk mempertahankan loyalitas pelanggannya, sebuah perusahaan memberi pelanggannya 3 jenis kartu anggota (member card), yakni: STANDAR, PLUS, dan PREMIUM. Setiap pelanggan akan mendapatkan satu jenis kartu yang didasarkan pada frekuensi pembelian dan jumlah uang yang dibelanjakannya.

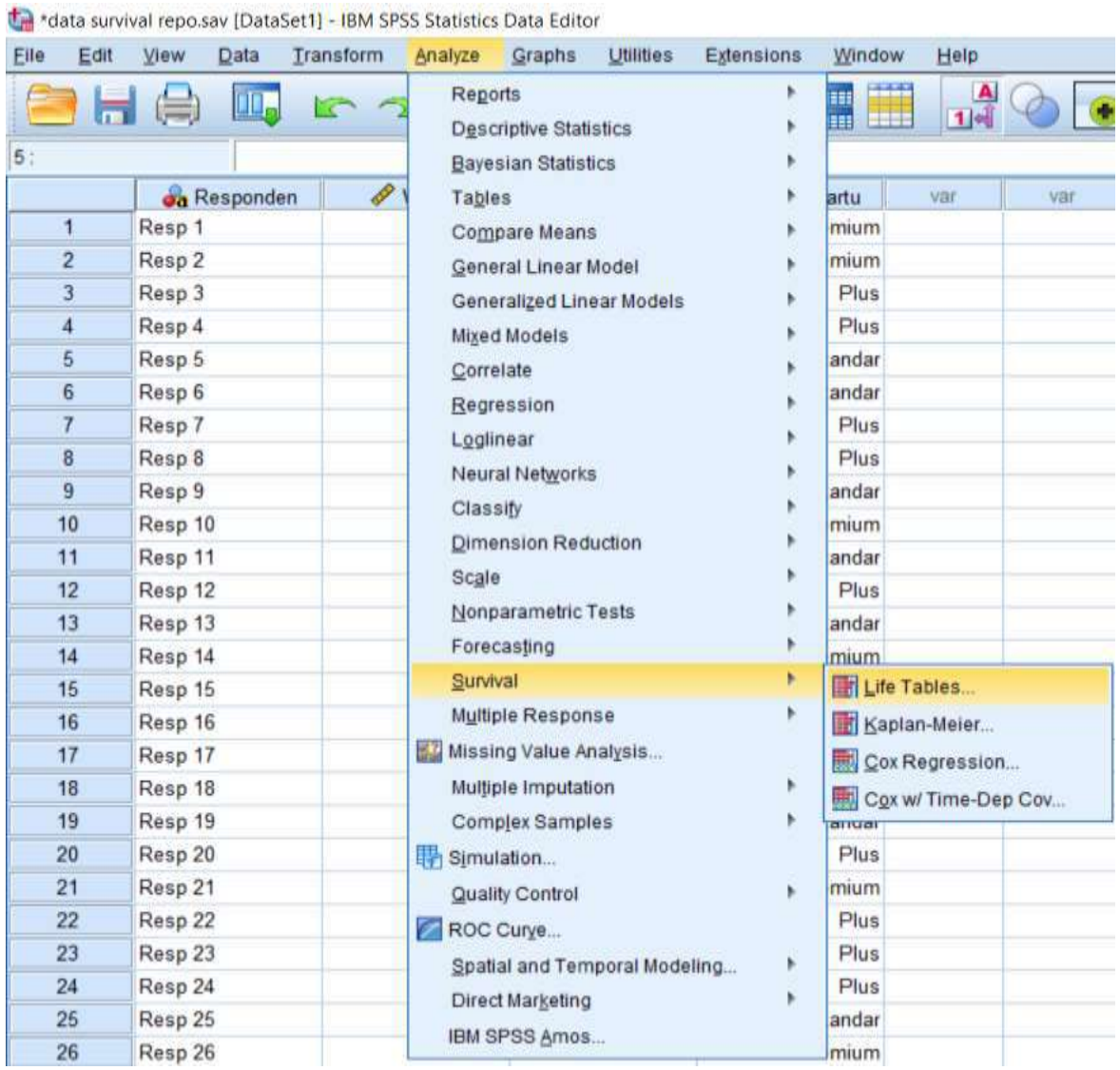
Dengan memiliki kartu tertentu, pelanggan akan mendapatkan fasiltias tertentu yang disertai dengan syarat pembelian minimal tertentu pula. Pelanggan dengan kartu standar akan mendapatkan pelayanan dan persyaratan yang berbeda dengan pelanggan yang tergolong plus atau premium.

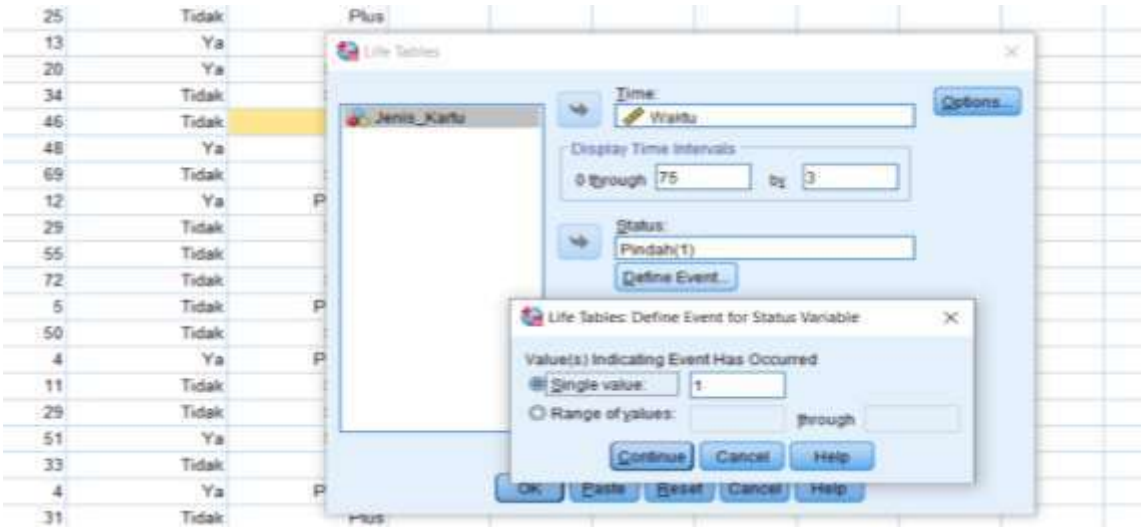
Mengingat persaingan yang ketat dan dinamika perilaku konsumen perusahaan memperkirakan pelanggan akan banyak yang berpindah kartu (walaupun diharapkan mereka tidak berpindah kartu). Jika mereka berpindah golongan/kartu ke bank lain, maka perusahaan akan mencatat waktu seseorang memiliki kartu sampai dia memutuskan pindah ke kartu lainnya. Untuk itu perusahaan memantau dan mengumpulkan data 300 kartu pelanggan

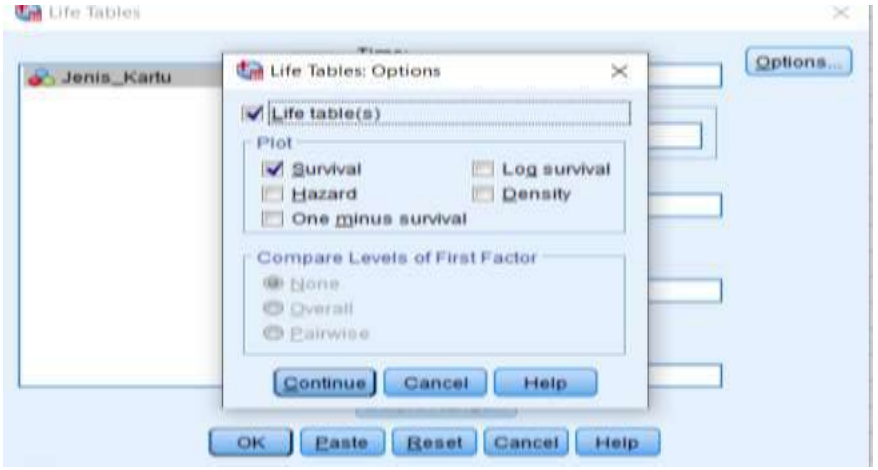
DATA KARTU PELANGGAN

	Responden	Waktu	Pindah	Jenis_Kartu
1	Resp 1	18	Ya	Premium
2	Resp 2	16	Tidak	Premium
3	Resp 3	25	Tidak	Plus
4	Resp 4	13	Ya	Plus
5	Resp 5	20	Ya	Standar
6	Resp 6	34	Tidak	Standar
7	Resp 7	46	Tidak	Plus
8	Resp 8	48	Ya	Plus
9	Resp 9	69	Tidak	Standar
10	Resp 10	12	Ya	Premium
11	Resp 11	29	Tidak	Standar
12	Resp 12	55	Tidak	Plus
13	Resp 13	72	Tidak	Standar
14	Resp 14	5	Tidak	Premium
15	Resp 15	50	Tidak	Standar
16	Resp 16	4	Ya	Premium

Fungsi dan Perintah Survival Analyis







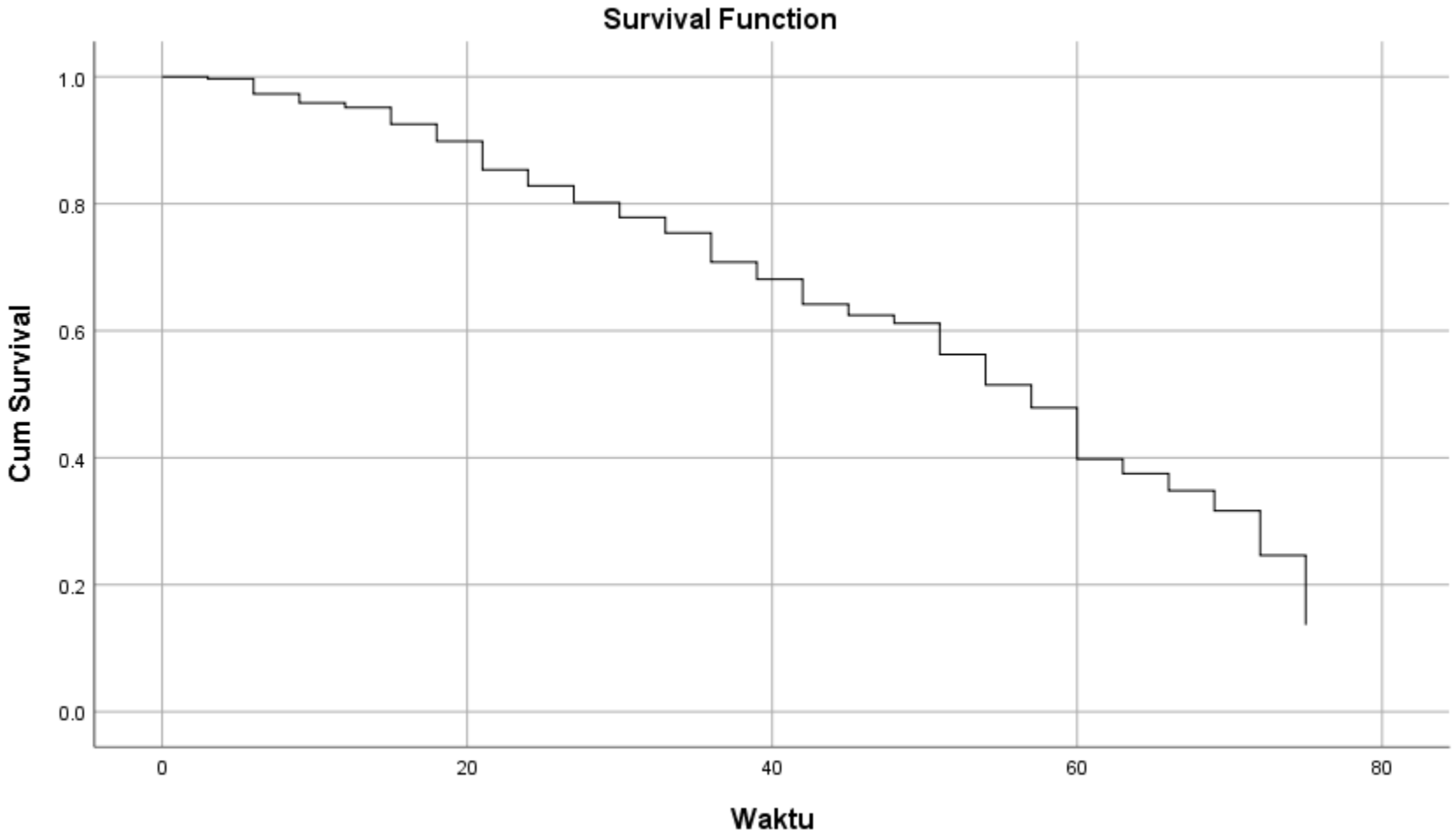
TABEL HASIL

Life Table[a]

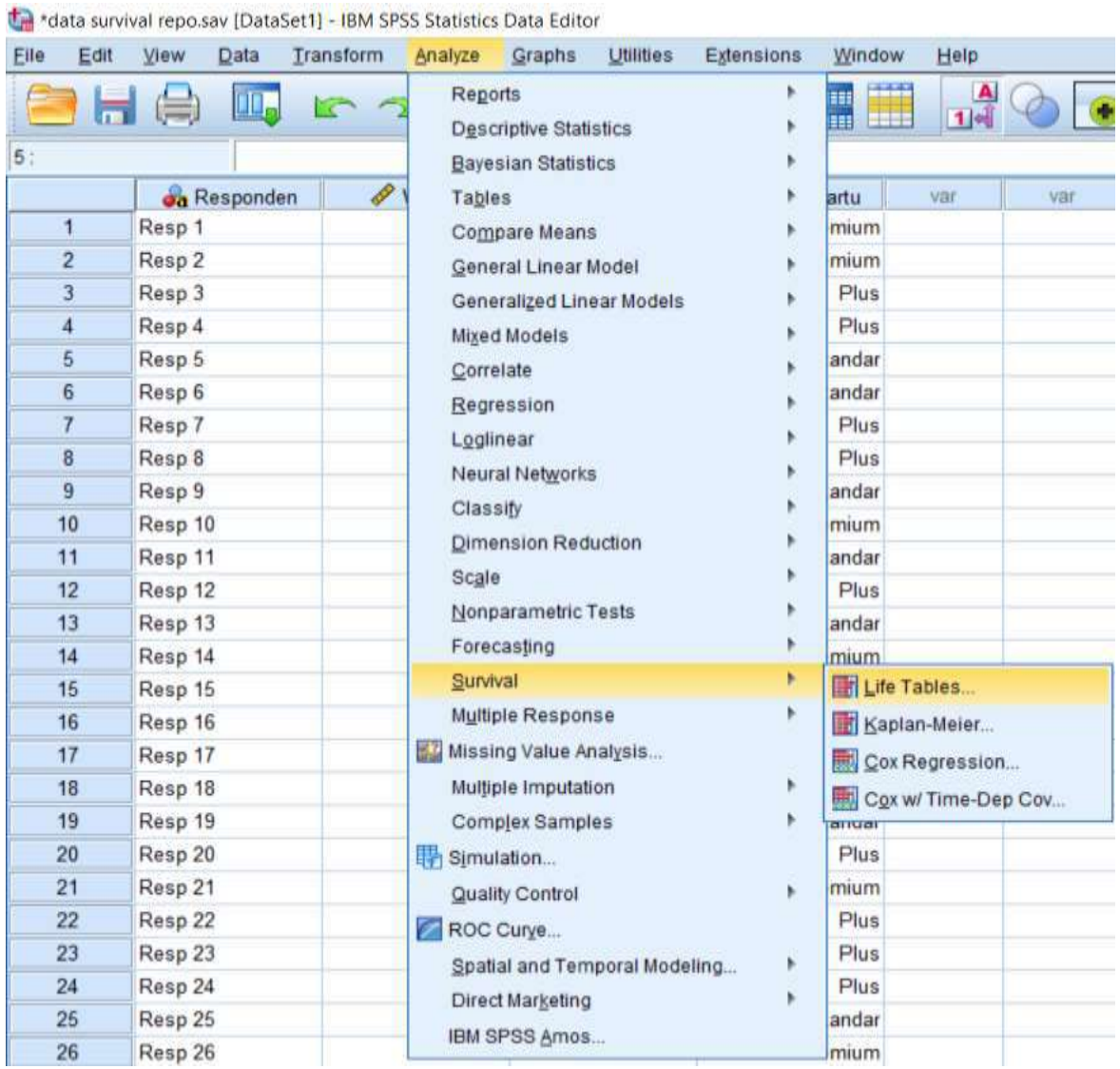
Interval Start Time	Number Entering Interval	Number Withdrawing during Interval	Number Exposed to Risk	Number of Terminal Events	Proportion Terminating	Proportion Surviving	Cumulative Proportion Surviving at End of Interval	Std. Error of Cumulative Proportion Surviving at End of Interval	Probability Density	Std. Error of Probability Density	Hazard Rate	Std. Error of Hazard Rate
0	300	0	300.000	1	.00	1.00	1.00	.00	.001	.001	.00	.00
3	299	12	293.000	7	.02	.98	.97	.01	.008	.003	.01	.00
6	280	7	276.500	4	.01	.99	.96	.01	.005	.002	.00	.00
9	269	7	265.500	2	.01	.99	.95	.01	.002	.002	.00	.00
12	260	9	255.500	7	.03	.97	.93	.02	.009	.003	.01	.00
15	244	12	238.000	7	.03	.97	.90	.02	.009	.003	.01	.00
18	225	7	221.500	11	.05	.95	.85	.02	.015	.004	.02	.01
21	207	8	203.000	6	.03	.97	.83	.02	.008	.003	.01	.00
24	193	13	186.500	6	.03	.97	.80	.03	.009	.004	.01	.00
27	174	5	171.500	5	.03	.97	.78	.03	.008	.003	.01	.00
30	164	8	160.000	5	.03	.97	.75	.03	.008	.004	.01	.00
33	151	7	147.500	9	.06	.94	.71	.03	.015	.005	.02	.01
36	135	7	131.500	5	.04	.96	.68	.03	.009	.004	.01	.01
39	123	3	121.500	7	.06	.94	.64	.03	.013	.005	.02	.01
42	113	6	110.000	3	.03	.97	.62	.03	.006	.003	.01	.01
45	104	9	99.500	2	.02	.98	.61	.03	.004	.003	.01	.00
48	93	12	87.000	7	.08	.92	.56	.04	.016	.006	.03	.01
51	74	7	70.500	6	.09	.91	.51	.04	.016	.006	.03	.01
54	61	8	57.000	4	.07	.93	.48	.04	.012	.006	.02	.01
57	49	3	47.500	8	.17	.83	.40	.04	.027	.009	.06	.02
60	38	7	34.500	2	.06	.94	.37	.04	.008	.005	.02	.01
63	29	2	28.000	2	.07	.93	.35	.04	.009	.006	.02	.02
66	25	6	22.000	2	.09	.91	.32	.04	.011	.007	.03	.02
69	17	7	13.500	3	.22	.78	.25	.05	.023	.012	.08	.05
72	7	5	4.500	2	.44	.56	.14	.06	.036	.021	.19	.13

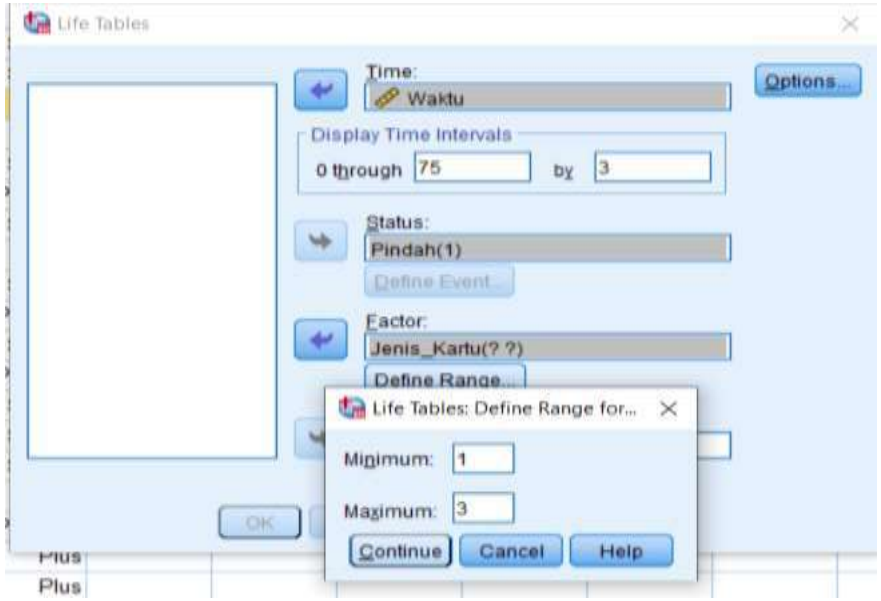
a. The median survival time is 55.22

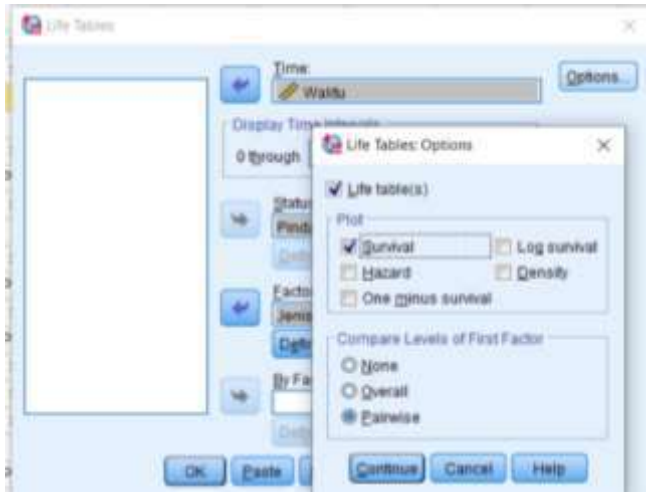
Survival Diagram



DATA DENGAN KATEGORISASI





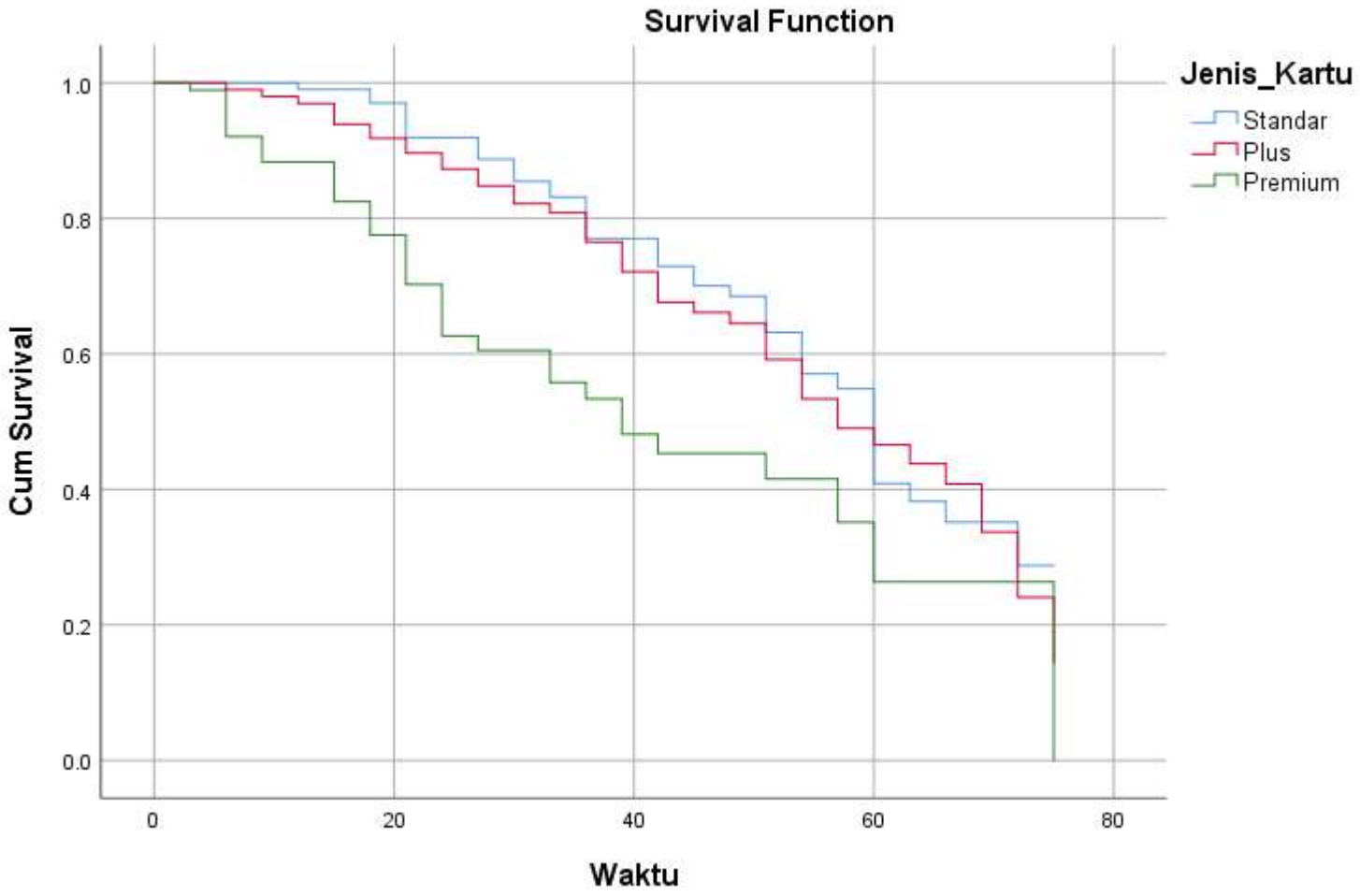


Tabel Hasil

Life Table

First-order Controls		Interval Start Time	Number Entering Interval	Number Withdrawing during Interval	Number Exposed to Risk	Number of Terminal Events	Proportion Terminating	Proportion Surviving	Cumulative Proportion Surviving at End of Interval	Std. Error of Cumulative Proportion Surviving at End of Interval	Probability Density	Std. Error of Probability Density	Hazard Rate	Std. Error of Hazard Rate
Jenis_Kartu	Standar	0	106	0	106.000	0	.00	1.00	1.00	.00	.000	.000	.00	.00
		3	106	3	106.500	0	.00	1.00	1.00	.00	.000	.000	.00	.00
		6	103	0	103.000	0	.00	1.00	1.00	.00	.000	.000	.00	.00
		9	105	2	104.000	1	.01	.99	.99	.01	.003	.003	.00	.00
		12	102	3	100.500	0	.00	1.00	.99	.01	.000	.000	.00	.00
		15	99	2	98.000	2	.02	.98	.97	.02	.007	.005	.01	.00
		18	95	0	95.000	5	.05	.95	.92	.03	.017	.007	.02	.01
		21	90	2	89.000	0	.00	1.00	.92	.03	.000	.000	.00	.00
		24	88	2	87.000	3	.03	.97	.89	.03	.011	.006	.01	.01
		27	83	4	81.000	3	.04	.96	.85	.04	.011	.006	.01	.01
		30	76	4	74.000	2	.03	.97	.83	.04	.008	.005	.01	.01
		33	70	4	68.000	5	.07	.93	.77	.04	.020	.009	.03	.01
		36	61	4	59.000	0	.00	1.00	.77	.04	.000	.000	.00	.00
		39	57	2	56.000	3	.05	.95	.73	.05	.014	.009	.02	.01
		42	52	2	51.000	2	.04	.96	.70	.05	.010	.007	.01	.01
		45	48	5	45.500	1	.02	.98	.69	.05	.005	.005	.01	.01
		48	42	7	38.500	3	.08	.92	.63	.06	.018	.010	.03	.02
		51	32	2	31.000	3	.10	.90	.57	.06	.020	.011	.03	.02
		54	27	2	26.000	1	.04	.96	.55	.06	.007	.007	.01	.01
		57	24	1	23.500	6	.26	.74	.41	.07	.047	.017	.10	.04
		60	17	3	15.500	1	.06	.94	.38	.07	.009	.009	.02	.02
		63	13	1	12.500	1	.08	.92	.35	.07	.010	.010	.03	.03
		66	11	3	9.500	0	.00	1.00	.35	.07	.000	.000	.00	.00
		69	8	5	5.500	1	.18	.82	.29	.09	.021	.020	.07	.07
		72	2	2	1.000	0	.00	1.00	.29	.09	.000	.000	.00	.00
	Plus	0	100	0	100.000	0	.00	1.00	1.00	.00	.000	.000	.00	.00
		3	100	1	99.500	1	.01	.99	.99	.01	.003	.003	.00	.00
		6	98	0	98.000	1	.01	.99	.98	.01	.003	.003	.00	.00
		9	97	1	96.500	1	.01	.99	.97	.02	.003	.003	.00	.00
		12	95	1	94.500	3	.03	.97	.94	.02	.010	.006	.01	.01
		15	91	2	90.000	2	.02	.98	.92	.03	.007	.005	.01	.01
		18	87	6	84.000	2	.02	.98	.90	.03	.007	.005	.01	.01
		21	79	4	77.000	2	.03	.97	.87	.03	.009	.005	.01	.01
		24	73	6	70.000	2	.03	.97	.85	.04	.009	.006	.01	.01
		27	65	1	64.500	2	.03	.97	.82	.04	.009	.006	.01	.01
		30	62	3	60.500	1	.02	.98	.81	.04	.005	.004	.01	.01
		33	58	3	56.500	3	.05	.95	.77	.05	.014	.008	.02	.01
		36	52	0	52.000	3	.06	.94	.73	.05	.016	.008	.02	.01
		39	49	1	48.500	3	.06	.94	.68	.05	.016	.008	.02	.01
		42	45	2	44.000	1	.02	.98	.66	.05	.005	.005	.01	.01
		45	42	3	40.500	1	.02	.98	.64	.06	.005	.005	.01	.01
		48	38	3	36.500	3	.08	.92	.59	.06	.010	.010	.03	.02
		51	32	3	30.500	3	.10	.90	.53	.06	.019	.011	.03	.02
		54	26	3	24.500	2	.08	.92	.49	.06	.015	.010	.03	.02
		57	21	2	20.000	1	.05	.95	.47	.07	.009	.009	.02	.02
		60	18	2	17.000	1	.06	.94	.44	.07	.009	.009	.02	.02
		63	15	1	14.500	1	.07	.93	.41	.07	.010	.010	.02	.02
		66	13	3	11.500	2	.17	.83	.34	.07	.034	.016	.06	.04
		69	8	2	7.000	2	.29	.71	.24	.06	.032	.020	.11	.08
		72	4	3	2.500	1	.40	.60	.14	.09	.032	.027	.17	.16
	Premium	0	92	0	92.000	1	.01	.99	.99	.01	.004	.004	.00	.00
		3	91	6	87.000	6	.07	.93	.92	.03	.023	.009	.02	.01
		6	77	7	73.500	3	.04	.96	.89	.03	.013	.007	.01	.01
		9	67	4	65.000	0	.00	1.00	.89	.03	.000	.000	.00	.00
		12	63	5	60.500	4	.07	.93	.82	.04	.019	.009	.02	.01
		15	54	8	50.000	3	.06	.94	.78	.05	.016	.008	.02	.01
		18	43	1	42.500	4	.09	.91	.70	.06	.024	.012	.03	.02
		21	38	2	37.000	4	.11	.89	.63	.06	.025	.012	.04	.02
		24	32	5	29.500	1	.03	.97	.61	.06	.007	.007	.01	.01
		27	26	0	26.000	0	.00	1.00	.61	.06	.000	.000	.00	.00
		30	26	1	25.500	2	.08	.92	.56	.07	.016	.011	.03	.02
		33	23	0	23.000	1	.04	.96	.53	.07	.009	.009	.01	.01
		36	22	3	20.500	2	.10	.90	.49	.07	.017	.012	.03	.02
		39	17	0	17.000	1	.06	.94	.45	.07	.009	.009	.02	.02
		42	16	2	15.000	0	.00	1.00	.45	.07	.000	.000	.00	.00
		45	14	1	13.500	0	.00	1.00	.45	.07	.000	.000	.00	.00
		48	13	2	12.000	1	.08	.92	.43	.08	.013	.012	.03	.03
		51	10	2	9.000	0	.00	1.00	.43	.08	.000	.000	.00	.00
		54	8	3	6.500	1	.15	.85	.36	.09	.031	.020	.06	.06
		57	4	0	4.000	1	.25	.75	.26	.10	.029	.026	.10	.09
		60	3	2	2.000	0	.00	1.00	.26	.10	.000	.000	.00	.00
		63	1	0	1.000	0	.00	1.00	.26	.10	.000	.000	.00	.00
		66	1	0	1.000	0	.00	1.00	.26	.10	.000	.000	.00	.00
		69	1	0	1.000	0	.00	1.00	.26	.10	.000	.000	.00	.00
		72	1	0	1.000	1	1.00	.00	.00	.00	.088	.033	67	.00

Survival Diargram dan Median



Median Survival Time

First-order Controls		Med Time
Jenis_Kartu	Standar	58.04
	Plus	56.31
	Premium	37.93

Overall Comparisons[a]

Wilcoxon (Gehan) Statistic	df	Sig.
18.871	2	.000

a. Comparisons are exact.


STARTUP


BUSINESS MANAGEMENT

END OF SLIDE


INFORMATICS & BUSINESS INSTITUTE
EDUCATIO UNIVERSALIS
DARMAJAYA


STRATEGY


PARTNERSHIP