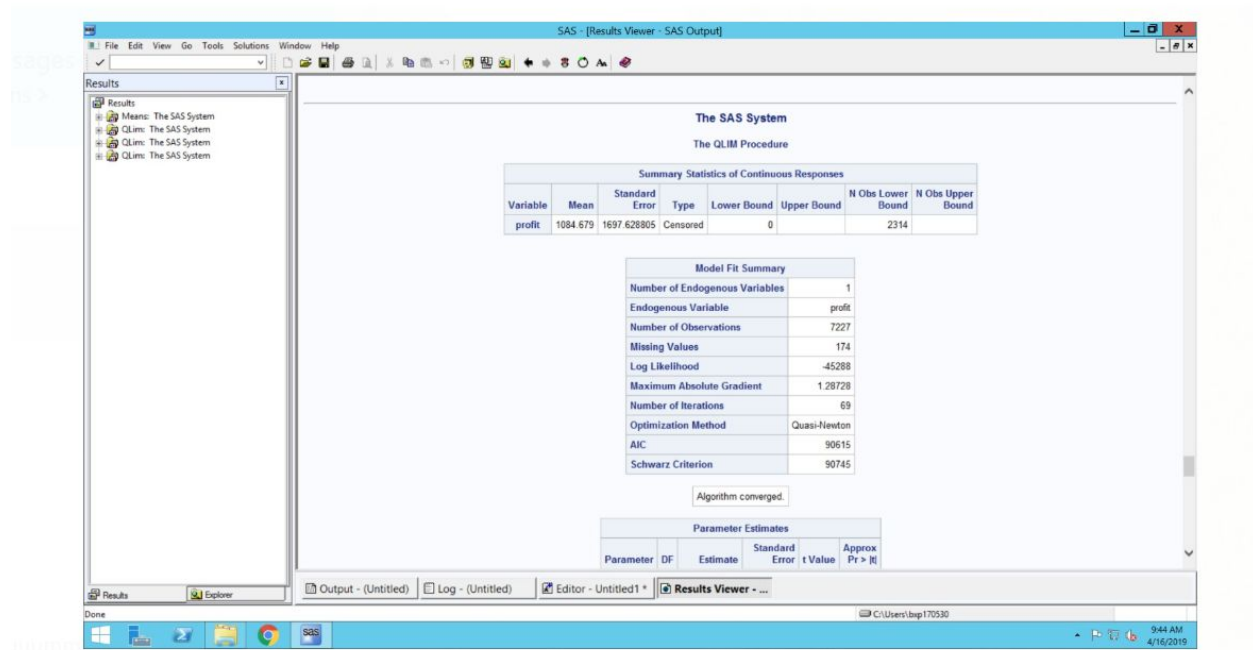


Group 7 : Assignment 6

1.



- ☐ The Summary Statistics of Continuous Responses table provides a summary of the number of left- censored values
- ☐ Model Fit Summary includes information on the number of observations = 7227, the number of iterations it took for the model to converge = 174, the final log likelihood, and the AIC and SC.

SAS - [Results Viewer - SAS Output]

Results

Parameter Estimates

Parameter	DF	Estimate	Standard Error	t Value	Approx Pr > t
Intercept	1	219.816056	143.074965	1.54	0.1245
age	1	-18.921041	1.850993	-10.22	<.0001
tottrans	1	47.022007	1.255105	37.46	<.0001
rewards	0	318.890685	71.579730	4.46	<.0001
rewards	1	0	0	-	-
limit	1	-9.162669	3.450903	-2.66	0.0079
numcard	1	53.934746	52.122833	1.03	0.3008
mode	1	183.698957	107.073414	1.72	0.0862
mode	2	-826.417108	129.167169	-6.40	<.0001
mode	3	-830.991890	112.199102	-7.41	<.0001
mode	4	0	0	-	-
cardType	1	-482.328163	131.336445	-3.67	0.0002
cardType	2	667.649283	75.094033	8.89	<.0001
cardType	3	13.978097	194.194123	0.07	0.9426
cardType	4	0	0	-	-
affinity	0	422.031211	83.844093	5.03	<.0001
affinity	1	614.089777	87.239741	7.04	<.0001
affinity	2	210.956662	98.737728	2.14	0.0326
affinity	3	287.942472	90.145922	3.19	0.0014
affinity	4	103.434062	91.135360	1.13	0.2564
affinity	5	0	0	-	-
_Sigma	1	1851.381013	19.258937	96.13	<.0001

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SAS - [Results Viewer - SAS Output]

Results

Algorithm converged.

Parameter Estimates

Parameter	DF	Estimate	Standard Error	t Value	Approx Pr > t
Intercept	1	361.570029	258.727734	1.40	0.1623
age	1	47.225508	10.403250	4.54	<.0001
age_2	1	-0.679926	0.106710	-6.43	<.0001
tottrans_s	1	479.610719	12.515697	38.32	<.0001
rewards	1	-236.292868	71.170274	-3.32	0.0009
limit_s	1	-189.465209	34.590186	-5.48	<.0001
numcard	1	56.062495	51.930283	1.08	0.2803
ds	1	-732.213087	99.782481	-7.34	<.0001
ts	1	-1032.833240	56.732587	-18.21	<.0001
net	1	-73.038481	106.750975	-0.68	0.4939
gold	1	-317.193619	185.683894	-1.71	0.0876
standard	1	-616.592994	76.706669	-8.03	<.0001
quantum	1	-854.851764	108.685330	-7.87	<.0001
sectorB	1	262.874799	87.871032	2.99	0.0028
sectorC	1	-348.787029	104.335488	-3.34	0.0008
sectorD	1	-45.496285	93.332190	-0.49	0.6259
sectorE	1	-245.993547	93.386482	-2.63	0.0084
sectorF	1	-398.862574	83.489417	-4.78	<.0001
_Sigma	1	1842.356884	19.191981	96.00	<.0001

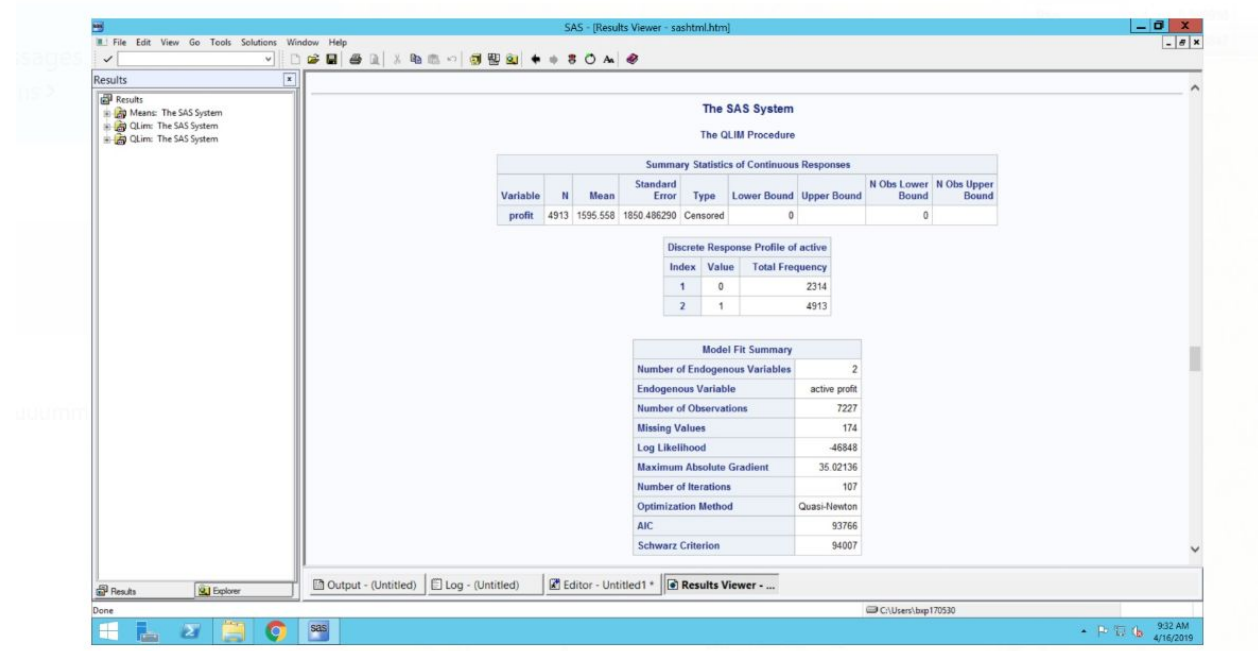
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- ❑ The coefficients for age, tottrans, rewards, limit, mode = 'ds' and 'ts' (with mode = 'net' as the reference category), cardType = 'quantum' and 'platinum' (with cardType = 'standard' as reference category), affinity = 'sectorA', 'sectorB', 'sectorC' and 'sectorD' (with affinity = 'sectorF' as reference category) are statistically significant
- ❑ A one year increase in age is associated with a \$18.92 decrease in the predicted value of profit.

- ☐ A one dollar increase in total transaction amount is associated with a \$47000 increase in the predicted value of profit
- ☐ A one dollar increase in credit limit is associated with a \$9169.928 decrease in the predicted value of profit
- ☐ The predicted value for profit is 318.89 higher for customers without reward card than for customers with reward card
- ☐ The predicted value for profit is 826.17 lower for customers acquired through direct selling than for customers acquired through internet
- ☐ The predicted value for profit is 830.99 lower for customers acquired through telephone selling than for customers acquired through internet
- ☐ The predicted value for profit is 482.32 lower for customers with quantum card than for customers with standard card.

2.



Parameter	DF	Estimate	Standard Error	t Value	Approx Pr > t
profit.intercept	1	1788.171843	132.759012	13.47	<.0001
profit.age	1	-3.983860	1.814369	-2.20	0.0281
profit.tottrans_s	1	311.507217	11.814775	26.37	<.0001
profit.rewards	1	-111.034148	70.545244	-1.57	0.1155
profit.limit_s	1	-154.569244	31.323373	-4.93	<.0001
profit.numcard	1	-61.987974	50.859451	-1.20	0.2297
profit.ds	1	24.755941	95.075819	0.26	0.7946
profit.ts	1	-3.777984	29.305332	-0.13	0.8930
profit.net	1	-116.495789	101.173663	-1.15	0.2495
profit.gold	1	-330.881026	193.047627	-1.71	0.0865
profit.standard	1	-782.323353	78.877085	-9.92	<.0001
profit.quantum	1	-832.019032	117.592134	-7.08	<.0001
profit.sectorB	1	272.450967	87.842658	3.10	0.0019
profit.sectorC	1	-58.590564	104.652059	-0.56	0.5756
profit.sectorD	1	-161.341149	93.917214	-1.72	0.0858
profit.sectorE	1	-166.685218	94.350014	-1.77	0.0773
profit.sectorF	1	-460.596553	82.287252	-5.60	<.0001
_Sigma.profit	1	1675.392631	16.900027	99.14	<.0001
active.intercept	1	1.745923	0.103661	16.84	<.0001
active.age	1	-0.020579	0	.	.
active.rewards	1	-0.359683	0.056389	-6.38	<.0001
active.limit_s	1	0.368186	0.028475	12.93	<.0001

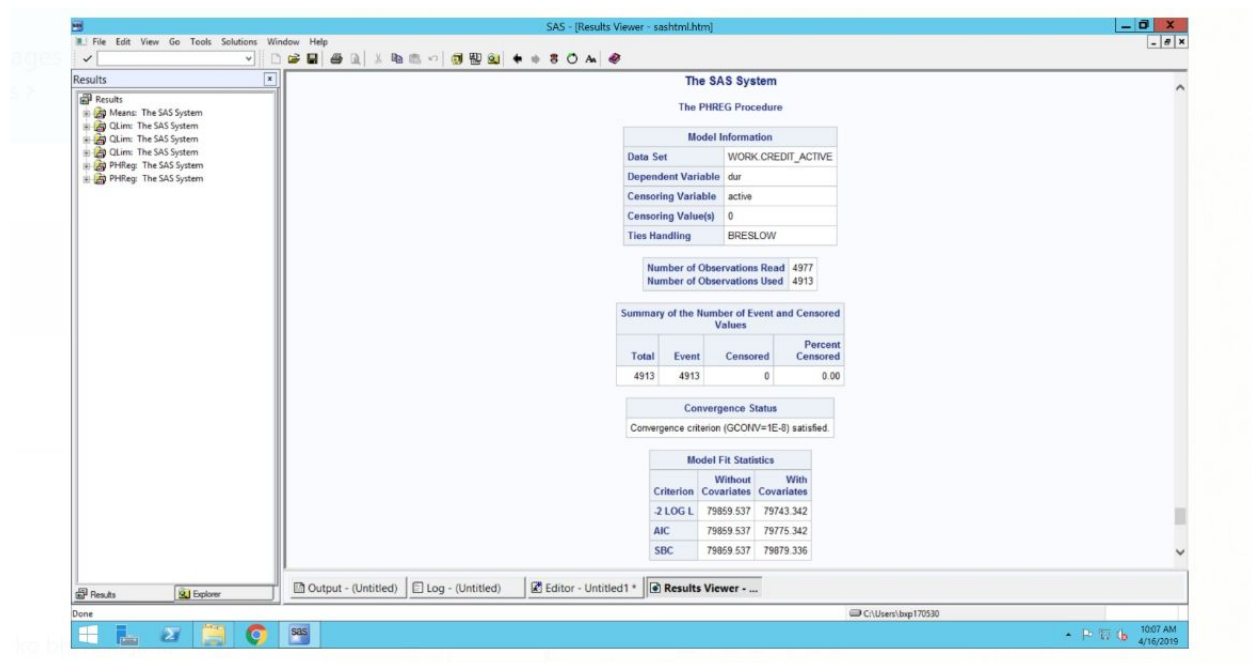
Parameter	DF	Estimate	Standard Error	t Value	Approx Pr > t
profit.quantum	1	-832.019032	117.592134	-7.08	<.0001
profit.sectorB	1	272.450967	87.842658	3.10	0.0019
profit.sectorC	1	-58.590564	104.652059	-0.56	0.5756
profit.sectorD	1	-161.341149	93.917214	-1.72	0.0858
profit.sectorE	1	-166.685218	94.350014	-1.77	0.0773
profit.sectorF	1	-460.596553	82.287252	-5.60	<.0001
_Sigma.profit	1	1675.392631	16.900027	99.14	<.0001
active.intercept	1	1.745923	0.103661	16.84	<.0001
active.age	1	-0.020579	0	.	.
active.rewards	1	-0.359683	0.056389	-6.38	<.0001
active.limit_s	1	0.368186	0.028475	12.93	<.0001
active.numcard	1	0.225428	0.040866	5.52	<.0001
active.ds	1	-1.285255	0.070378	-18.26	<.0001
active.ts	1	-1.311494	0.042837	-30.62	<.0001
active.net	1	-0.093705	0.097832	-0.96	0.3382
active.gold	1	-0.446271	0.136719	-3.26	0.0011
active.standard	1	-0.047042	0.053536	-0.88	0.3796
active.quantum	1	-0.769923	0.073354	-10.50	<.0001
active.sectorB	1	-0.079407	0.069580	-1.14	0.2538
active.sectorC	1	-0.261849	0.079102	-3.31	0.0009
active.sectorD	1	-0.052880	0.071890	-0.74	0.4620
active.sectorE	1	-0.261707	0.071116	-3.68	0.0002
active.sectorF	1	0.044134	0.067692	0.65	0.5144
_Rho	1	0.018207	.	.	.

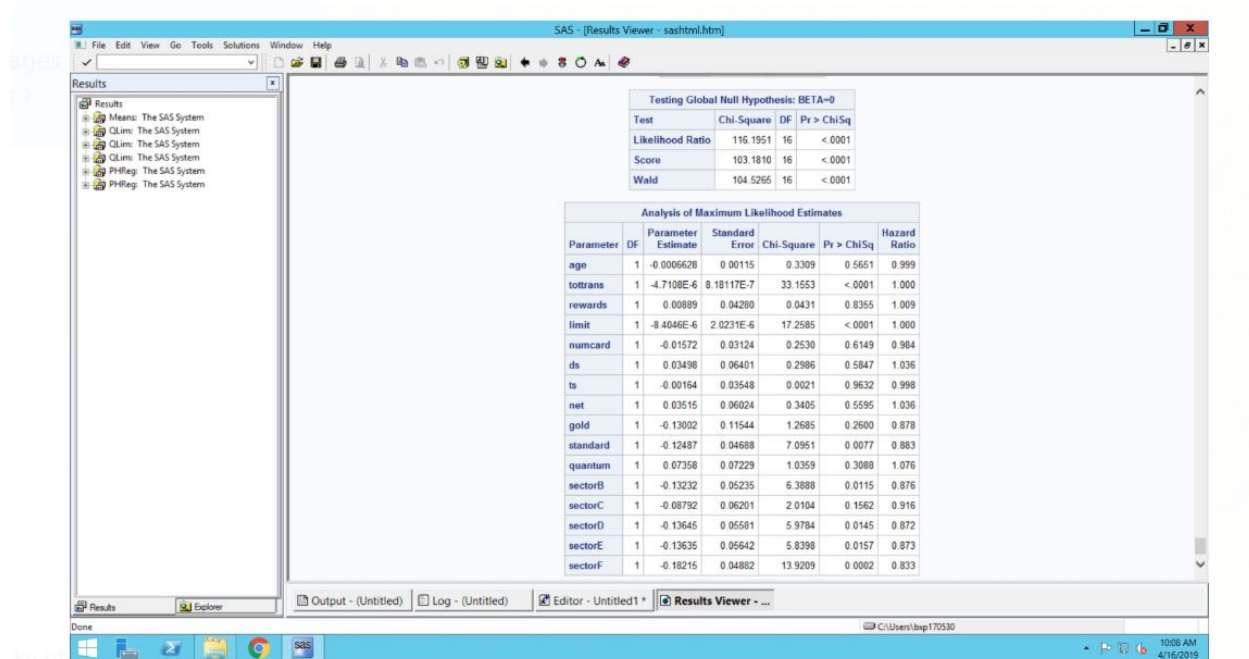
We can interpret the following from the above results:

- ☐ if customer credit limit increase by one unit (in ten thousand) then probability of a credit card customer being active, increases
- ☐ If a customer has a gold card, then probability of a credit card customer being active decreases, as compared to a customer who has a platinum or a standard card

- ❑ If a customer has an affinity card associated with Sports (sector C), then probability of a credit card customer being active decreases, as compared to a customer who has no affinity card(sectorA) OR who has an affinity card associated with Professional Organization(SectorB) OR who has an affinity card associated with Financial institution(section D) OR who has an affinity card associated with commercial(sectorF)
- ❑ A one unit (in ten thousand) increase in total transaction amount spent by the customer, while keeping all other variables constant, is associated with 311.507 point increase (on average) in profit
- ❑ No dummy variables of Modes of Acquisition are statistically different from zero. Hence, it is not an influencing variable in this model.

3.



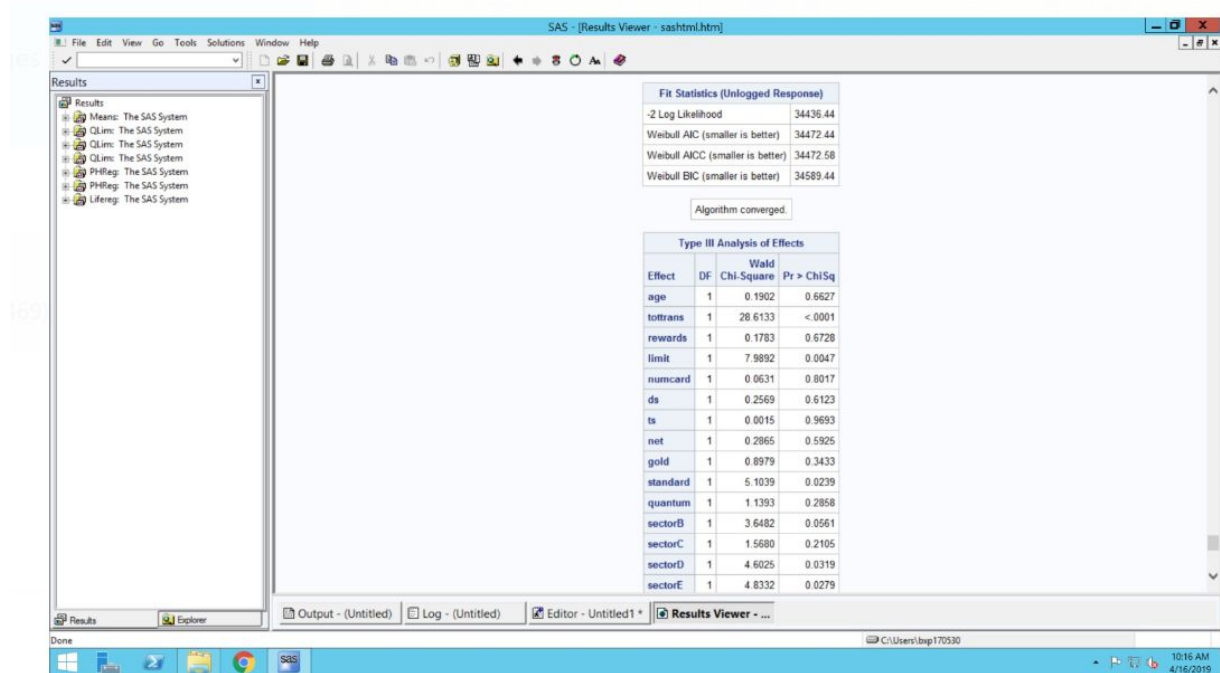
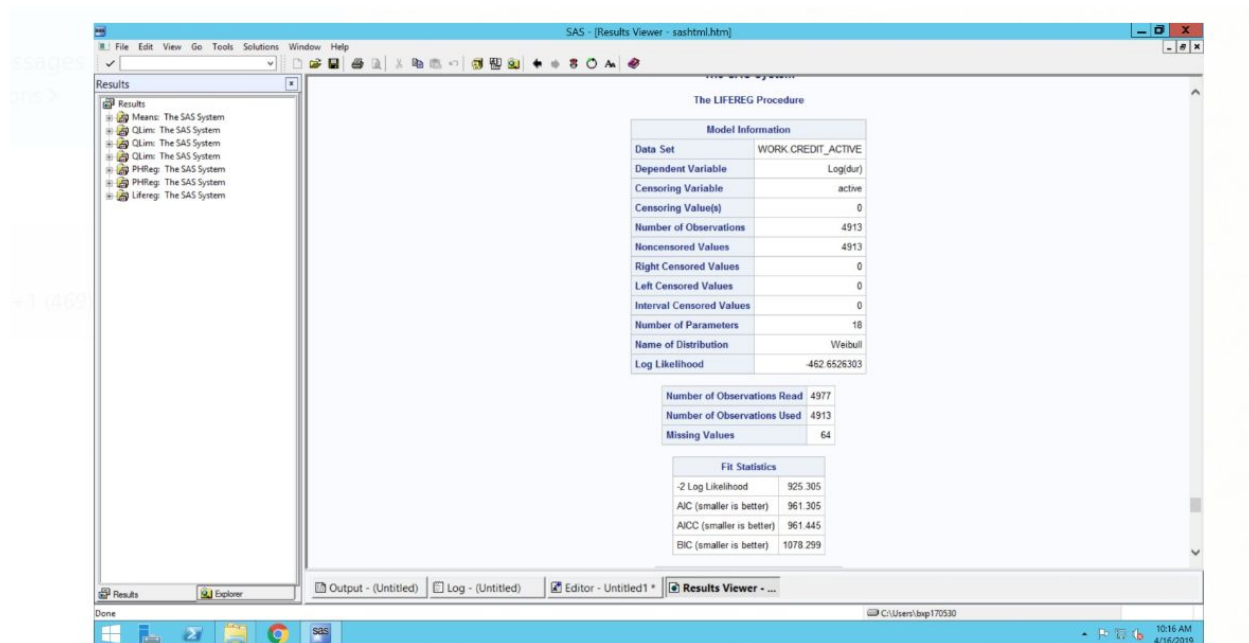


For running Survival Analysis, we first created a dummy variable to censor duration; if duration is greater than or equal to 37 months (3 years), then it is censored (0) else 1.

Factors such as Total Transaction Amount, Credit Limit of the Customer and if the customer has a STANDARD card or different types of Affinity Cards, play a significant role in deciding whether a particular customer will stay with the firm or not.

We can interpret the following from the above results:

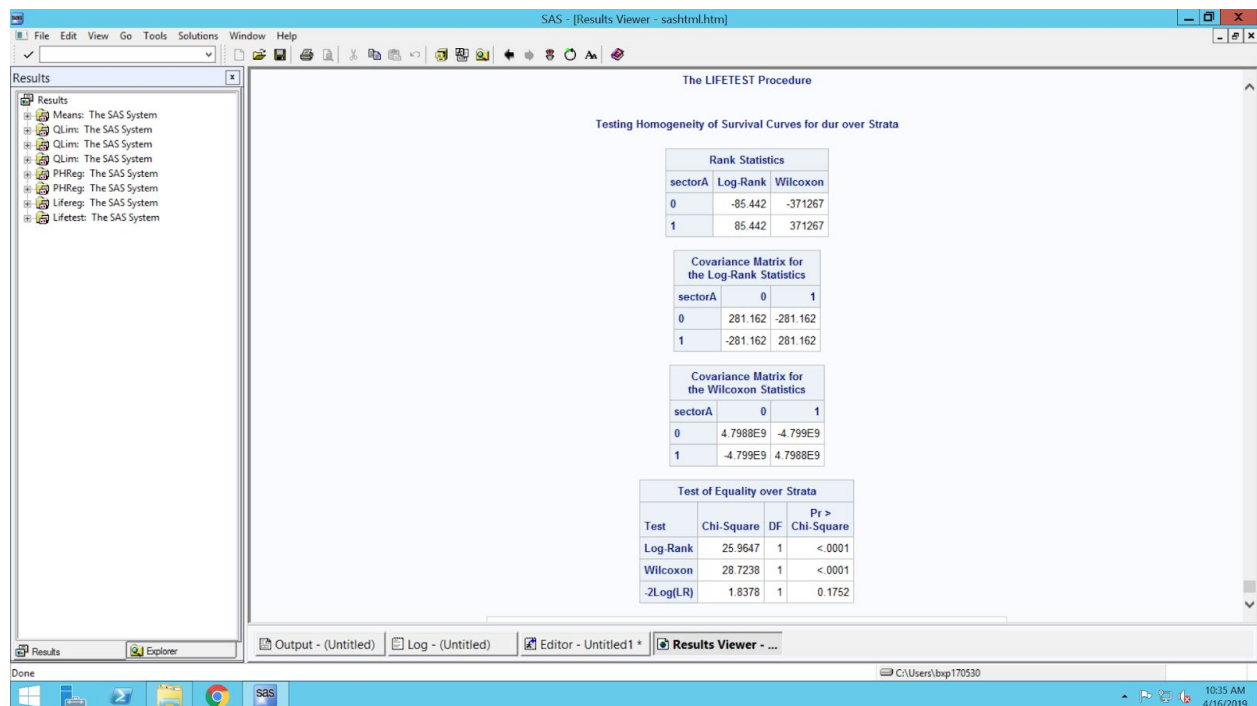
- ❑ If the total transactions made by the customer in 3 year period increases by 10000 units, then the hazard associated with the customer not being in the firm is expected to decrease by $(0.750-1)*100 \sim 25\%$
- ❑ If the credit limit of the customer in 3 year period increases by 10000 units, then the hazard associated with the customer not being in the firm is expected to decrease by $(0.802-1)*100 \sim 19.8\%$
- ❑ If a customer has Affinity Card associated with a Professional Organization, then the hazard associated with him not being in the firm decreases by $(0.730-1)*100 \sim 27\%$, compared to a customer having no Affinity Card.

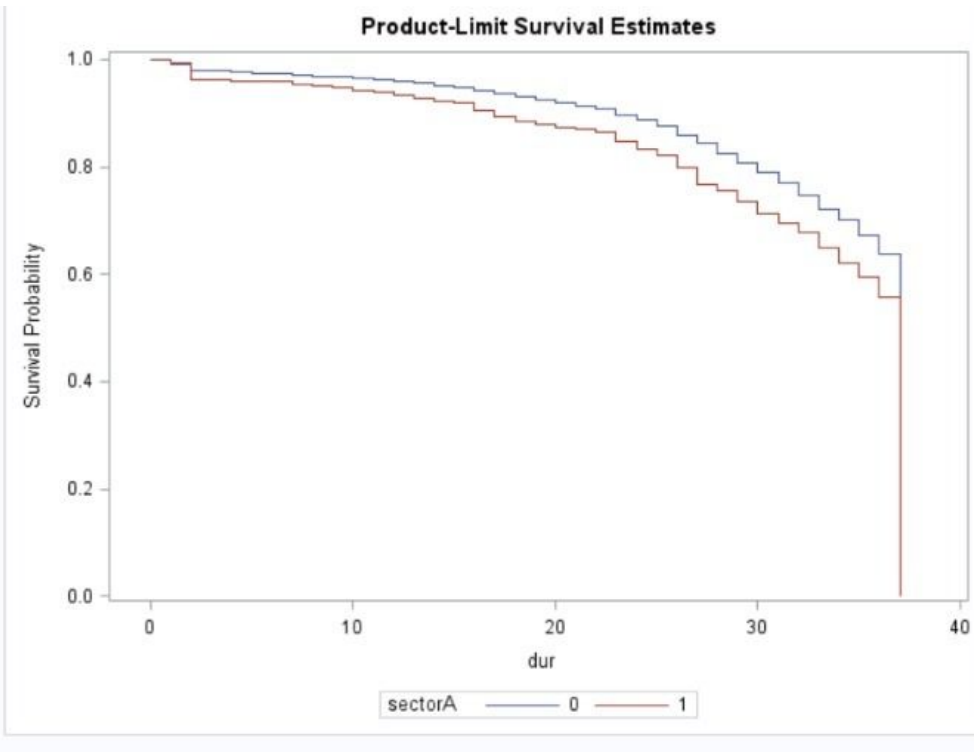


- ❑ From LIFEREG model, we can see that the same variables are significant which were significant in the PHREG model as well – Total Transactions by the customer, Credit limit of the customer, if the customer has a STANDARD card and Types of Affinity Cards that the customer has.

- ☐ If a customer has a STANDARD card, then expected ratio is $\exp(0.0084) = 1.08$ which means that the customer survives 1.5 times more as compared to a customer not having a STANDARD card. So its better to have standard card type to have better survival of a customer
- ☐ The variables that had positive coefficient estimates in PHREG model have negative coefficient estimate in LIFEREG model and vice-versa
- ☐ Customer having affinity card affiliated with Financial Institution or with University or with Commercial have lower inactive duration having other factors fixed.

5.





- ☐ We can note that the survivor function for affinity groups are significantly different from that of non-affinity groups based on the Chi-Square test of the log rank.
- ☐ Hence, we can interpret that the customer who does not have an affinity card has a lower chance of survival against a customer with an affinity card based on the above graph.
- ☐ In conclusion, we can say that the survivor function for affinity groups are significantly different from that of non-affinity groups.
- ☐ Since the customers that do have an affinity card have a lower chance of survival, that is, they would stop using the card, having an Affinity Card, therefore, gives the company a better chance a retaining a customer than not having one.