Survival Analysis with Base SAS Course

Project 2

# Due Date: 08/14/2016 Sunday 11:59 PM

**BACKGROUND**

1. Last year, you met Larry Hansen, COO of a very famous pharmaceutics company, FermaLogis, during a networking event. You told him about your background on analytics and, especially, the survival analysis projects you have been involved and how survival analysis can make an impact on business. He told you although he didn’t have thorough knowledge of Survival Analysis, he started to hear the term more and more in the recent years, so he was very interested. You exchanged contact information and parted.

After seven months, you received an e-mail from Larry. The message is below:

“Dear ......,

I hope you are doing well and life is good over CT. I know it is summer time, and you have your own obligations but I need a small favor from you.

A few days after we chatted at the meeting, I encountered an essay on Survival Analysis on LinkedIn by a very esteemed colleague of mine. He wrote about many uses of survival analysis in many industries. So, my interest increased even more on the subject. I studied it but only on the theory part. My mathematics and analytics skills are not enough to do analytics myself. I came up with an idea to use it with the company data by some hand from you.

As I mentioned in my speech at the event, employees are very important for the FermaLogis operations as the main resource and input. So, we care about our employees a lot. However, there is this issue, employees are leaving the company and that is not a good thing for us for sure. Let me elaborate in two groups:

1. Young employees: We are investing a lot on the new employees in terms of professional training and salary without return for the first three years. Only after three years, we are starting to benefit from that new employee. But, at that time, they become more competent professionally and seek new career opportunities with higher salary and leave the company. This is a big problem because of two reasons. First, we can’t harvest what we invested and secondly, a talent gap hinders our operations.
2. Experienced employees: As I told you in the meeting, our company has an Executive Training Program. It is a very intense and useful program. Every year, our experienced employees (with the company for 5 years or more) are sent to a training center for two weeks and trained there by professors and consultant from top universities and firms. They gain a lot and they become even more competent each year.

We have enjoyed the benefits of the training program a lot. But, recently rival companies are recruiting our well-trained employees with high transfer fees and higher salaries. We definitely don’t want that for many reasons you can understand.

The reason why I am contacting you is that we want to know who are leaving our company and why they are leaving. If we can understand that, we believe we can take the necessary measures to prevent our employees from leaving.

I think that would be a very good application field for survival analytics. I am sending you our Employee Attrition data. If you are interested, please take a look at this and let me know what we can do about this.

Thanks,

Larry Hansen

Chief Operating Officer at FermaLogis

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1. You take a look at the data and see that this data can be used for the study. You agreed on the project details, fees and all the other payments. Your company, ......, writes and delivers a report on the following subjects.
   1. **Who are leaving the company?**
   2. **Why are they leaving?**
   3. **When is the biggest danger for employees to leave?**
   4. **Is there any difference of attrition between different employee groups or categories?**
   5. **Any other findings about the company.**

**FOLLOW UP EMAIL FROM LARRY (INFORMATION ON PROJECT 2)**

1. After a week, you receive this e-mail from Larry.

“

Dear ....,

We received your report and examined it very carefully. Although we liked the direction we are heading, there is one problem. We can’t align your results with our insights. I can’t tell why or how, but we think there is something missing.

I talked to HR director, and she said the problem may be that we are taking each turnover as the same. However, a retirement and a resignation can have different properties. We wanted to give a shot to this new approach. She also informed me that this data set wasn’t attrition dataset, but turnover data set. It seems attrition and turnover have a small difference in terms of human resources terminology but it doesn’t make a big difference for your analysis.

Anyway, please find attached a revised dataset with a field called “attrition type”. I hope this helps with your efforts of finding why our employees are leaving or who we are firing.

One other thing is we want to relate our past bonus pays with turnover so that we can use bonuses more effectively to prevent turnover. We think our bonus payments don’t play an important part in employee turnover, but you can never know.

These are the updates from our side. Let me know if you need anything and when you come up with something

Thanks and regards.

Larry Hansen

Chief Operating Officer at FermaLogis

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1. It seems there is a problem with your previous findings, because you know that voice of the business is always very important. And, they say something is not right. You look at the dataset and realize that the effects of covariates on one type of turnover may be different than another. So, you decide to take every event type separately. In other words, you decide to employ “Competing Risks” concept.

Another decision you had is to use the Cox Regression Model (PROC PHREG) with your analysis because Larry requires information on the bonuses, which is a time-dependent covariate.

1. You are expected to use the techniques in Chapter 12 and 13 to give an answer to the business problem. You need to consider these questions:
   1. Can I combine different event types together? Or do all need to be handled separately?
   2. What attributes increase/decrease the hazard rates for certain event types?
   3. Does bonus affect employee turnover? If yes, how?
   4. Are there any variables which affect hazards non-proportionally?
2. **The project deadline is 08/14/2016 11:59 PM.**
3. Grading will be based on your report. You must answer the general business needs of the company. The above questions on item 5 are only examples and they should be enriched.
4. 8009346489 8608388035 8604614679
5. GT 1 – they will leave the org – increasing the hazard rate and LT 1 they will stay in org & decreasing the hazard rate