If the Y values (# of events) at different time points are independent of each other, this is a typical non-parametric regression problem. I was not given enough information to decide, but since you guys gave me the example of selling tickets, I guess this is true in our case. So below I will explain how to do non-parametric regression. (If Y values at different time points are not independent of each other, we have to use longitudinal data analysis or time series analysis. That will be a totally different story.)

Non-parametric regression does not assume any distribution to the data. Different methods of non-parametric regression (Kernel regression, Nearest-Neighbor, etc.) all need to decide the bandwidth h to be used in the model. If will set h to a high value, we will get a very smooth curve. For example, if we set h to maximum (10 years), we will get a horizontal line and will not have any spikes. On the other hand, if we set h to a small value, we will get a curve not so smooth and will get more spikes. There are several methods to decide the value of h, for example Cross Validation, Penalizing Functions, etc. Fortunately R and SAS both have packages/procedures which can do all these things automatically, and we don’t need to know how to do it ourselves.

But if you still want know more, please refer to the attachment here, especially section 4.3.

As long as we get the non-parametric regression model, the remaining things will be easy. We can find all spikes of the regression curve, and compute how many of them fall into a given time range.

If the raw data won’t change in the future, we are already done (We build the model in R or SAS, and finish the remaining things in Java). But if the raw data will change, we might want to build the model in Java. We have 3 choices:

1.     Find a Java non-parametric regression API, or

2.     Call R non-parametric regression package in Java, or

3.     Code everything ourselves in Java. (In this case, programmers need to understand Chapter 4 of the attachment.)