**Continuous-Time Markov Chains**

In the slides we talked about the transition matrix between credit ratings D, CCC, B, BB, BBB, A, AA, and AA, or j=0 through 7. The probability of moving from rating j to rating k is in one year.

Question is: Suppose we have a time interval Can we write out a transition matrix for this time period? The answer is, sometimes.

Let

The idea is to try to express

Now let

Then we can try to write

Well this seems to work, so why do I say, **sometimes**?? This scheme may not work because (1) the series for G may not converge, and (2) may wind up with negative entries. But it’s worth a shot. However, the problem of finding, say, a 4th root (quarterly) transition matrix is very difficult and generally an unsolved problem. I will now try this for the transition matrix given in the book.