**A Simple Incremental Risk Charge Example**

Recall from Lecture 1 that IRC measures a type of VaR arising from migrations and defaults in credit-sensitive portfolios over a long time horizon, such as a year. IRC forms a critical part, and sometimes quite large part, of a bank’s regulatory capital. Usually rather than So we assume we have a portfolio of N T-year (assume T is an integral number of years) bonds, each paying the same coupon but discounted at different yields

In this notation, is the risk-free rate, and is the *credit spread* for bond i. We also assume that the credit spread is the *generic credit spread* assigned to company i’s credit rating which may be D, CCC, B, BB, BBB, A, AA, or AAA. Let these generic credit spreads for the non-default states be Assume that if a bond defaults, it pays us a fixed recovery amount R per unit notional after a year. We assume that at none of these are D. We also may refer to these credit ratings, as the book often does, as 0, 1, 2,…,7. So if one of these bonds has rating j, the probability of migrating to rating k at the end of the year is Refer to the transition matrix shown in the slides as an example.

We will also assume that if company i migrates from j to k in a year, then the credit spread will change from to and affect the value of the bond accordingly. The current value of each bond at time 0 is therefore

In this notation, is the notional amount of the bond. In a year, we may assume that the risk-free rate does not change, and that the credit spread of bond i after a year is After a year, the value of each bond will be

To simulate IRC in this example, consider standard normal rvs and assume that they follow a 1-dimensional equicorrelated factor model where for Recall that this means that we can write

We can think of F as the *market* factor. Many banks use this sort of model. For each we can compute thresholds with

Now we simulate the Z’s 50000 times, and for each simulation, for each bond, we let

Finally let

and take the 50th worst loss out of 50000. This is your IRC. Banks will often use the worst 500th out of half a million, but I would not ask you to do that. I created a very simple example of this with only 10000 scenarios in Excel.