

Pricing Credit Risk using the BSM model
Finance 4335 Class Problem

Problem Setup: Suppose two banks exist which are identical in all respects except for degree of financial leverage. At date $t = 0$, Bank 1 issues zero coupon deposits with a face value of $B_1 = \$500,000$, whereas bank 2 has issued zero coupon deposits with a face value of $B_2 = \$800,000$. Current asset value in both cases is $V(F) = \$1,000,000$, asset risk for both banks is $\sigma = .4$, and the annual rate of interest is 3%.

One year from today (at date $t = 1$), depositors expect these banks to pay back the face value of deposits with profits earned from investments. However, since bank assets are risky and both banks are limited liability corporations, there is a risk that they won't be paid in full.

Answer the following questions:

1. Suppose there is no deposit insurance, so Bank 1 and Bank 2 depositors are at risk for not being paid back in full at $t = 1$.
 - (a) What are the fair market values for the deposits held by Bank 1 and Bank 2 if there is no deposit insurance?

 - (b) What are the values of the limited liability put options held by Bank 1 and Bank 2?

 - (c) What are the risk neutral probabilities of bankruptcy for Bank 1 and Bank 2?

 - (d) What are the yields to maturity and credit risk premiums for Bank 1 and Bank 2?

2. Now suppose the government institutes a deposit insurance scheme in which bank deposits are fully insured against the risk of bankruptcy and banks are required to pay “fair” (i.e., risk-based) premiums for coverage.
 - (a) What are the fair premiums for deposit insurance paid by Bank 1 and Bank 2?

 - (b) What impact with the presence of the deposit insurance have upon the yields to maturity and credit risk premiums that depositors expect from Bank 1 and Bank 2?

 - (c) Now suppose the government charges premiums based upon the average of the fair premiums that Bank 1 and Bank 2 should pay. Analyze the implications of such a pricing scheme. Specifically, who wins and who loses, and what incentives are conveyed by such a scheme?