Introduction to Finance – I
CAT Bond Quiz

Show all work!

1. Consider a market with the following features:

   - A 4-year 4.25% US Treasury note that makes annual coupon payments–with the next payment exactly one year from settlement–sells for par.
   - The continuous hazard rate for the arrival of a major property-destroying earthquake in northern California is 0.75%.
   - Allstate has issued $400 million of northern California earthquake Cat bonds with a coupon rate of 7%. These are 4-year bonds that make annual coupon payments.

   (a) What is the continuously-compounded yield-to-maturity on the 4-year, 4.25% Treasury note?

   (b) What is the continuously-compounded yield-to-maturity on the earthquake Cat bond?

   (c) What is the price of the earthquake Cat bond?

   (d) What is the time-line of expected cash flows from the earthquake Cat bond?

2. Suppose that we see that the bond-equivalent yield-to-maturity on 5-year Treasury securities is 3.25%. Simultaneously we see that bond-equivalent yield to maturity on a 5-year Tokyo-earthquake 6% catastrophe bond is 6%.

   (a) What can we infer about the risk of an earthquake in Tokyo that is powerful enough to destroy all insured property from this information?

   (b) According to these markets, what is the probability that there is not an earthquake in Tokyo that is powerful enough to destroy all insured property during the next 5 years?

3. Consider a 50-year old who owns a $6,500,000 vacation house in the Hamptons. This house accounts for roughly 0.5% of her total assets. Suppose that the hazard rate for standard, insured hazards such as fire and wind, is 3% on a continuous basis.

   (a) What is the actuarially fair cost (in dollar terms) for hazard insurance on the house (in terms of an annual premium)?

   (b) Would we expect the homeowner in this case to be willing to pay more than the actuarially fair price of home insurance in this case? Explain carefully.

   (c) Suppose that the insurance company that issued this policy pools it with 100 other similar policies that are all on Long Island, New York, into the backing for a 4-year cat bond. What would the actuarially fair yield be in this case? Would the insurance company have to pay a higher yield on this bond than the actuarially fair yield? Explain carefully.