DSA 5303
Summer 2018

Homework 7

Please show all relevant work when you upload the assignment.

Problem 3.
Consider two bonds that have the same coupon, time to maturity and price. One is a B-rated corporate bond. The other is a CAT bond. An analysis based on historical data shows that the expected losses on the two bonds in each year of their life is the same. Which bond would you advise a portfolio manager to buy and why?

Problem 4.
Consider a commodity with constant volatility σ and an expected growth rate that is a function solely of time. Show that, in the traditional risk-neutral world,

$$\ln S_T \sim \phi \left[\ln F(T) - \frac{\sigma^2 T}{2}, \sigma^2 T \right]$$

where S_T is the value of the commodity at time T, $F(t)$ is the futures price at time 0 for a contract maturing at time t, and $\varphi(m,v)$ is a normal distribution with mean m and variance v.

Problem 5.
An insurance company's losses of a particular type are to a reasonable approximation normally distributed with a mean of $150 million and a standard deviation of $50 million. (Assume no difference between losses in a risk-neutral world and losses in the real world.) The 1-year risk-free rate is 5%. Estimate the cost of the following:
  (a) A contract that will pay in 1 year's time 60% of the insurance company's losses on a pro rata basis.
  (b)   A contract that pays $100 million in 1 year's time if losses exceed $200 million.