FINM3033 Risk Management in Finance

Assignment 1

Problem 1.
A bank estimates that its profit next year is normally distributed with a mean of 0.8% of assets and the standard deviation of 2% of assets. How much equity (as a percentage of assets) does the company need to be (a) 99% sure that it will have a positive equity at the end of the year and (b) 99.9% sure that it will have positive equity at the end of the year? Ignore taxes.

Problem 2.
A financial institution has the following portfolio of over-the-counter options on pounds:

Type	Position	Delta of Option	Gamma of Option	Vega of Option
Call	−1,000	0.5	2.2	1.8
Call	-500	0.8	0.6	0.2
Put	-2000	−0.40	1.3	0.7
Call	-500	0.70	1.8	1.4

A traded option is available with a delta of 0.6, a gamma of 1.5, and a vega of 0.8. Suppose that a second traded option, with a delta of 0.1, a gamma of 0.5, and a vega of 0.6, is also available. How could the portfolio be made delta, gamma, and vega neutral?

Problem 3.
A company's investments earn LIBOR minus 0.5%. Explain how it can use the quotes in Table 5.5 from our textbook to convert them to (a) three-, (b) five-, and (c) ten-year fixed-rate investments.

Problem 4.
Prove (a) that the definitions of duration in equations (9.1) and (9.3) from our textbook are the same when y is continuously compounded and (b) that when y is compounded m times per year they are the same if the right-hand side of equation (9.3) is divided by $1 + y/m$.

Problem 5.
A five-year bond with a face value of \$100 and a yield of 10% (continuously compounded) pays an 8% coupon at the end of each year. (a) What is the bond's price? (b) What is the bond's duration? (c) Use the duration to calculate the effect on the bond's price of a 0.2% decrease in its yield. (d) Recalculate the bond's price on the basis of a 9.8% per annum yield and compare the result with your answer to (c).