Homework #2: Futures and credit risk

FE-620 Fall 22

Due 14 Oct 2022

Problem 2.1
A trader enters into a short cotton futures contract when the futures price is 50 cents per pound. The contract is for delivery of 50,000 pounds. How much does the trader gain or lose if the cotton price at the end of the contract is

(a) 48.20 cents per pound

(b) 51.30 cents per pound

Problem 2.2: Arbitrage with commodity futures
The spot price of oil is \$80.0 per barrel and the cost of storing a barrel of oil for one year is \$2, payable at the end of the year. The risk-free interest rate is 4.0% per annum continuously compounded. What is the estimated one-year futures price of oil?

Problem 2.3: Equity index (variation on problem 5.27 in Hull)
An equity index is 1,700. The three-month risk-free rate is 1.0% per annum and the dividend yield over the next three months is 1.5% per annum. The six-month risk-free rate is 1.5% per annum and the dividend yield over the next six months is also 1.5% per annum.

Estimate the futures price of the index for three-month and six-month contracts. All interest rates and dividend yield are continuously compounded.

Problem 2.4: Bootstrapping the hazard rates from CDS spreads
Consider a Credit Default Swap with maturity 2 years, paying a premium with semi-annual frequency.

Assume that defaults can occur only at times 0.25 years, 0.75 years, 1.25 years and 1.75 years, as in the example discussed in class. (This is similar to the simplifying assumption made in the example discussed in Chapter 25.2 in Hull; in real applications the defaults are allowed to take place any day, but this would complicate the computation.)

The CDS spread is 255 basis points. Assume that the risk-free interest rate is 2.5% (with continuous compounding) and the recovery rate is $R = 40\%$.

What is the hazard rate of the reference name? Assume a constant hazard rate for the entire maturity of the CDS.

Problem 2.5
The spread between the yield on a 2-year corporate bond and the yield on a similar risk-free bond is 250 basis points. The recovery rate is 40%.

i) Estimate the average hazard rate over the 2-year period.

ii) Compute the probability that the company issuing the bond will default in 2 years.