

## Assignment 1

Assignment answers should be submitted on Moodle in PDF format.

## 1 Risk pooling

Pick values for  $h$  and  $p$ ; for instance,  $h = 0.2$  and  $p = 0.5$ . Suppose that the demand random variables  $D_1, \dots, D_N$  are independent. Compare  $S$  to  $\Sigma$  (cf. notes for Lecture 6 for the definitions) for the following settings:

1. (10 points) Let  $N = 5$ , and let the demand distributions  $F_1, \dots, F_N$  all be normal with mean 10 and variance 2.
2. (1 point) Let  $N = 10$ , and let the demand distributions  $F_1, \dots, F_N$  all be normal with mean 10 and variance 2.
3. (1 point) Let  $N = 20$ , and let the demand distributions  $F_1, \dots, F_N$  all be normal with mean 10 and variance 2.
4. (8 points) How does the ratio  $S/\Sigma$  change with  $N$ ?
5. (10 points) Let  $N = 10$ , and let the demand distributions  $F_1, \dots, F_N$  all be normal with mean 10 and variance 1.
6. (1 point) Let  $N = 10$ , and let the demand distributions  $F_1, \dots, F_N$  all be normal with mean 10 and variance 2.
7. (1 point) Let  $N = 10$ , and let the demand distributions  $F_1, \dots, F_N$  all be normal with mean 10 and variance 3.
8. (8 points) How does the ratio  $S/\Sigma$  change with the variance?
9. (10 points) What is the take-away lesson from this exercise?

## 2 A more realistic the beer game

1. (10 points) If all players to know the demand at the same time as the retailer, how should each player take this information into account in his or her order sizes?
2. (20 points) If each player knows the inventory level of each other player, how would it affect his or her order size?

3. (30 points) Design a new more realistic beer game where each player has a finite amount of money, each player sets prices for his goods, orders cost money. Write a document with figures explaining in detail the rules for this new game, following the template of the document on [beergame.org](http://beergame.org).
  - (a) You may add any rule that you like to make this game more realistic.
  - (b) For example, this new game ends when all players goes bankrupt. A bankrupt player cannot order anything and loses all inventory. The winner is the player with most money at the end.