

# **CASE STUDY:**

# **NEWSVENDOR PROBLEM**

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# SETUP

- ✖ Rupert sells daily newspapers on street
  - + Rupert buys for  $c = \$0.55$  each, sells for  $r = \$1.00$  each
- ✖ Each morning, Rupert buys  $q$  copies
  - +  $q$  is a fixed number, same every day
- ✖ Demand during a day:  $D = \max(\lfloor X \rfloor, 0)$ 
  - +  $X \sim \text{normal}(\mu = 135.7, \sigma = 27.1)$ , from historical data
  - +  $\lfloor X \rfloor$  rounds  $X$  to nearest integer
- ✖ If  $D \leq q$ , satisfy all demand, and  $q - D \geq 0$  left over, sell for scrap at  $s = \$0.03$  each
- ✖ If  $D > q$ , sells out (sells all  $q$  copies), no scrap
  - + But missed out on  $D - q > 0$  sales
- ✖ What should  $q$  be?

# SOLVE IT USING SIMULATION

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- ✖ Build the model
  - + Challenges
  - + Tips:
    - ✖ Conversion of double data to int.
      - \* E.g. (int)normal (sigma, mu)

# SOLVE IT USING SIMULATION

## ✖ Questions:

- + What's the profit if Rupert bought 100 news papers?
  - ✖ 1. Using random seed 1, one run only
  - ✖ 2. What's his long-term expected profit? Using multiple runs (1000). Add a plot showing the profit of each run. Add a “statistics” to calculate the overall mean profit.
- + What's the profit if Rupert bought 200 news papers?
  - ✖ 1. Using random seed 2, one run only
  - ✖ 2. Long-term expected profit. Using multiple runs (1000). Add a plot showing the profit of each run. Add a “statistics” to calculate the overall mean profit.

# SOLVE IT USING SIMULATION (CONT.)

- + What's Rupert's long-term strategy (how many news papers to buy) and his expected profit? (Use OptQuest)