



Random Inventory System Simulation

590PR - Final Project Presentation

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A wide-angle photograph of a large industrial warehouse. The floor is made of concrete, and the ceiling is high with several bright fluorescent lights. In the foreground and middle ground, there are tall metal shelving units. On these shelves, numerous cardboard boxes are stacked in organized piles. Some boxes have shipping labels or barcodes. The lighting creates strong shadows and highlights the texture of the cardboard. A large white speech bubble is overlaid on the right side of the image, containing the word "Agenda".

Agenda

- Motivation
- Scenario
- Solution
- Results
- Possible future steps

Motivation

- In the process of supply, it is always necessary to maintain a certain inventory reserve since the arrivals and sales cannot be the same amount and synchronized.

Too many stocks



Funded backlog



Rise of custodial fees

Few stocks



Loss of merchants' reputation



Loss of customers

Scenario

- A warehouse manager of a bicycle store uses a simple ordering strategy.
- When the inventory quantity is reduced to P bicycles, it will order the quantity of Q from the manufacturer.
- Order fee is 75\$, the storage fee per bicycle is 0.75 \$/day, the current inventory is 115, and currently there is no order

Scenario

- **Assumption:**

- Daily demand ~ Normal distribution $N(50, 5^2)$
- Probability distribution of delivery lead time

Lead Time	1	2	3	4
Probability	10%	50%	30%	10%

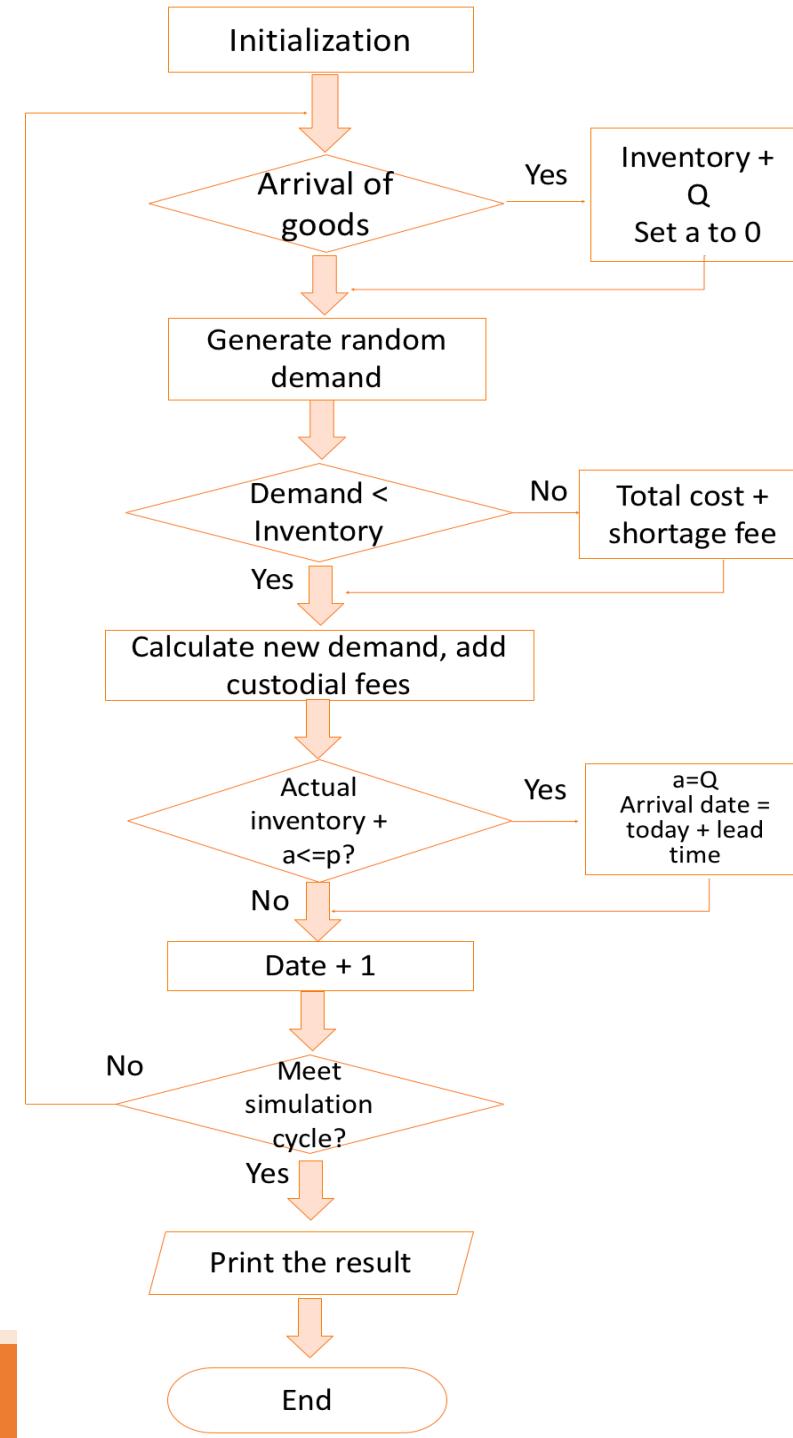
- Out of stock, lose 50\$/unit
- No overlap between two orders

Solution

- Cost:
 - Cost per order (\$75)
 - Cost of out of stock(\$50) opportunity cost
 - Cost of inventory (\$0.75 per item per day)
- Purpose: Minimum total cost

Solution

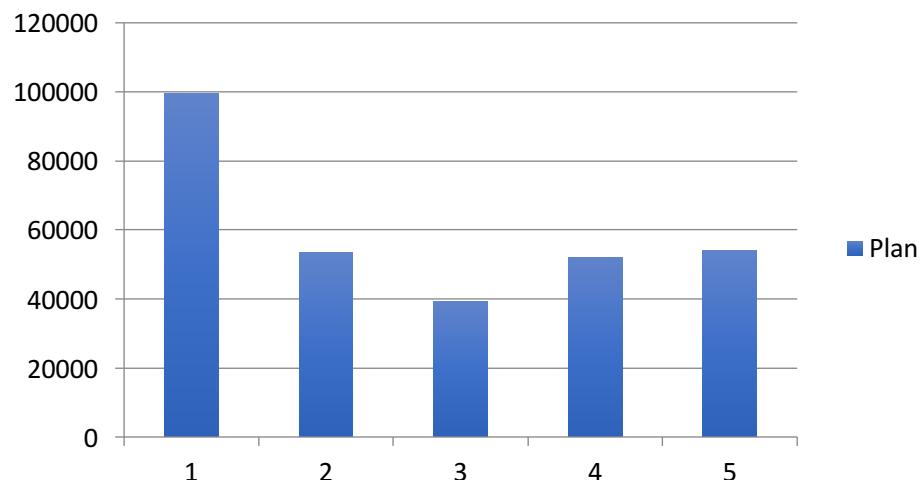
- Simulation Process (300 days)



Result

Plan	1	2	3	4	5
P (need to order products if the number of products is less than p)	120	120	150	200	250
Q (the number of products purchase each time)	150	200	200	250	200
Expected shortfall	109958.675	58771.2	45333.375	50623.5	54806.325

Expected shortfall for 5 different plans



Possible future steps

- Build models to bring the **maximum profit** for this shop
- Add more types of bicycles to make this scenario more realistic
- Think about the scenario that customer may return or exchange the product based some probability distribution

A wide-angle photograph of a large industrial warehouse. The floor is made of concrete, and the ceiling is high with several bright fluorescent lights. In the background, there are tall metal shelving units filled with numerous cardboard boxes stacked on wooden pallets. A red sign with white numbers is visible on one of the shelving units, showing '19' and '20'.

Thank for watching!

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