Monte Carlos Long Term Prediction

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Goal

When would the food company have a shortage and need 2rd production line in following 18 months?

Background

Monte Carlos Simulation:

Toss a coin 5,000 or 10,000 time and the prob of Head would infinitely close to 0.5!

Demand > Supply

1) XYZ is served in 10,000 restaurants today

2) Every month 200-1000 new restaurants start serving XYZ but 0.5-1% of existing restaurants stop serving

3) Each restaurant buys an average of 50 lbs of burger per week and this average increases randomly by 0% to 2.5% each week

4) Every week the plant can produce a random amount of burger between 1 million and 1.5 million lbs

5) The factory freezer can store up to 3 million lbs of burger indefinitely and currently has 1 million lbs stored

6) The second production line would double production capacity

- **All variables are independent**
- **All variables could be considered as uniform distribution**

Total Demand

of customers * demand

# of customers = last month customer *(1-churn rate) + add customers

Demand = last week demand * (1+ increase rate)

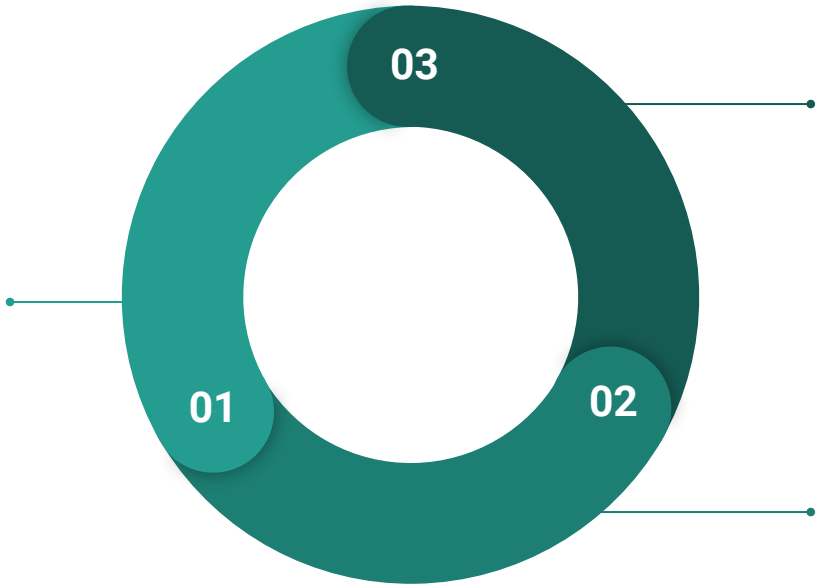
Supply

Storage + producing volume

Storage: max, current

Current storage: min(max, last week storage + produced - demand)

Monte Carlos Simulation Method



Monte Carlos Simulation

Generate Demand, Supply and Storage lists

Build Functions

Step 1: Build Function

1) Build a function to compute weekly customer numbers using two uniform distributions: monthly customer increase and monthly customer stop serving rate;

2) Build a function to calculate the weekly demand, supply and storage;

Step 2: Generate lists

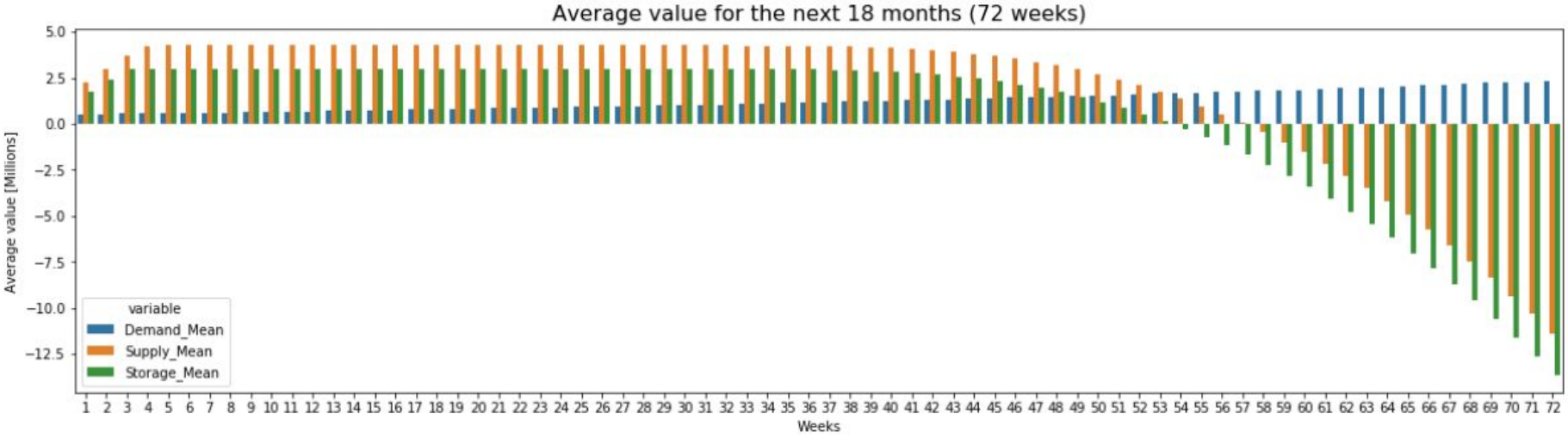
3) Use the above function to get 3 lists of 72 (18 * 4) weeks' value for demand, supply and storage;

4) Generate 2 lists of 18 monthly values for monthly customer increase and monthly customer stop serving rate, generate 2 lists of 72 (18*4) weekly value for weekly customer demand increase rate and weekly production value;

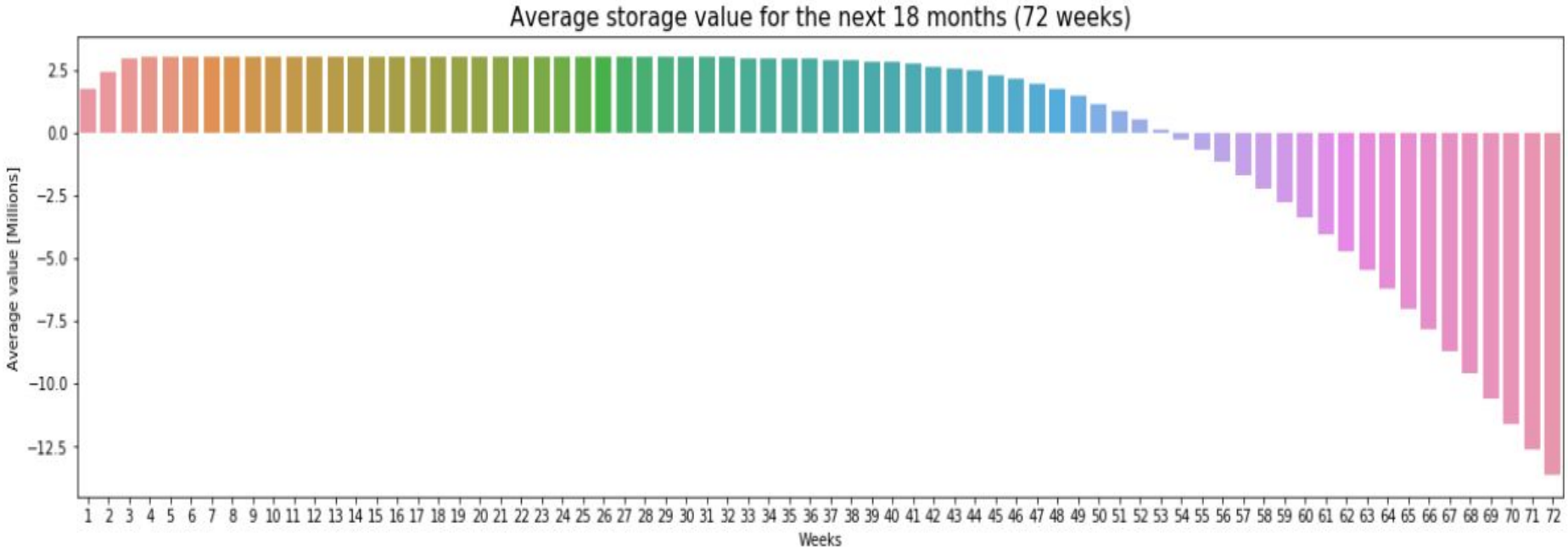
Step 3: Monte Carlos Simulation mean and standard deviation

5) Implement Monte Carlo simulation 5000 times, and calculate the mean value and standard deviation of 5000 time's Monte Carlos iteration for demand, supply and storage

6) Calculate the 90% and 99% confidence intervals and use the lower bound values to find the shortage week and month


Average value for the next 18 months (72 weeks)
Average value [Millions]
5.0
2.5
0.0
−2.5
−5.0
−7.5
−10.0
−12.5
variable
Demand_Mean
Supply_Mean
Storage_Mean
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72
Weeks

See shortage week: 54th



There is not big difference between 90% and 99% lower bound value