Operations Research: Models, Algorithms, and Implementations

2025-08-30

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Preface

This is a Quarto book.

To learn more about Quarto books visit https://quarto.org/docs/books.

Part I

1

Inventory Management

Note

Just In Time, JIT
JIT JIT
Lean Manufacturing

-

1.
2.

Scientific Inventory Management

1.
2.

1.1

demand (Deterministic) Stochastic
review (Continuous Review) (Periodic Review) 1
lead time 0 0
backorder
planning horizon (Single Period) (Multi Period) (Infinite)

EOQ
Wagner-Whitin

1.2

ordering cost 1 fixed cost 1 K
purchase cost c
stockout cost p
holding cost 1 h

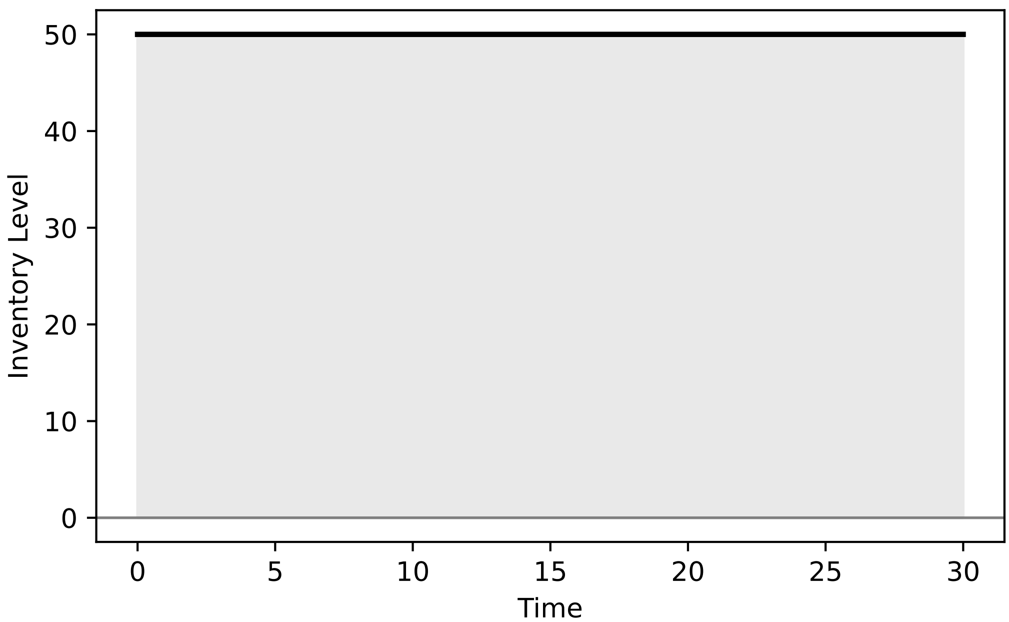
1 1 h 30 50 $30 \times 50 \times h = 1500h$

$\times h = 1500h$

```
import matplotlib.pyplot as plt
import numpy as np

t = np.linspace(0, 30, 1000)
inventory = np.full_like(t, 50)

# Plotting the inventory level
plt.fill_between(t, inventory, color="lightgray", alpha=0.5, label="Inventory Level")
plt.plot(t, inventory, label="Inventory Level", color="black", linewidth=2)
plt.xlabel("Time")
plt.ylabel("Inventory Level")
plt.axhline(0, color="gray", linewidth=1)
plt.tight_layout()
plt.show()
```

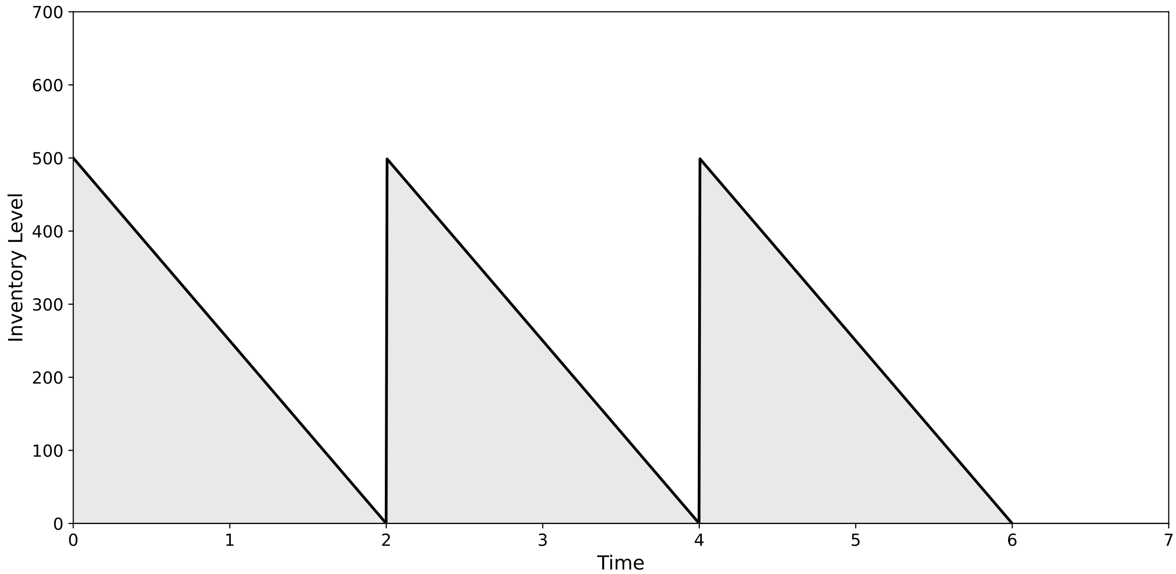


500 6

```
# Parameters
d = 250  # Demand rate
Q = 500  # Order quantity
T = Q / d  # Cycle length
t = np.linspace(0, 2.999 * T, 1000)

# Inventory level over time
inventory = np.maximum(0, Q - (d * t) % Q)

# Plotting the inventory level
plt.figure(figsize=(12, 6))
plt.fill_between(t, inventory, color="lightgray", alpha=0.5, label="Inventory Level")
plt.plot(t, inventory, label="Inventory Level", color="black", linewidth=2)
plt.xlabel("Time", fontsize=14)
plt.ylabel("Inventory Level", fontsize=14)
plt.xticks(fontsize=12)
plt.yticks(fontsize=12)
plt.axhline(0, color="gray", linewidth=1)
plt.ylim(bottom=0, top=Q + 200)
plt.xlim(0, 3.5 * T)
plt.tight_layout()
plt.show()
```



$$\frac{2 \times 500}{2} \times 3 \times h$$