CUS commerce undergraduate society

COMM 204 (Tim Huh)

Final Exam Review Session

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CMP

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FORECASTING

Sales of Honda Civics have grown steadily at auto dealerships in Vancouver during the past 5 years. The sales manager had predicted before the new model was introduced that first year sales would be 410 cars. Using exponential smoothing with a weight of α=0.30, develop forecasts for years 2 through 6.

Year	Sales	Forecast
1	450	410
2	495	410+0.3(450-410) = 422
3	518	422+0.3(495-422) = 443.9
4	563	443.9+0.3(518-443.9) = 466.1
5	584	466.1+0.3(563-466.1) = 495.2
6	600	495.2 + 0.3(584-495.2) = 521.8

Redo the previous question but forecast using the Naïve approach:

Year	Sales	Forecast
1	450	410
2	495	450
3	518	495
4	563	518
5	584	563
6	600	584

A large Portland manufacturer wants to forecast demand for a piece of pollution-control equipment. A review of past sales, as shown below, indicates that an increasing trend is present:

Month	Actual Demand	Month	Actual Demand
1	12	6	21
2	17	7	31
3	20	8	28
4	19	9	36
5	24	10	?

Smoothing constants are assigned the values of α=0.2 and β=0.4. The firm assumes the initial forecast average for month 1 (F_1) was 11 units and the trend over the period (T_1) was 2 units.

a) Forecast average for month 2:

$F_2 = \alpha A_1 + (1-\alpha)(F_1+T_1)$

$F_2 = (0.2)(12)+(1-0.2)(11+2) = 2.4 + 10.4 = 12.8$ units

b) Compute the trend in period 2:

$T_2 = \beta(F_2 - F_1) + (1-\beta)\, T_1$

$T_2 = 0.4(12.8-11) + (1-0.4)(2) = 0.71+1.2 = 1.92$

c) Computer the forecast including trend (FIT_t)

$FIT_2 = F_2 + T_2 = 12.8+1.92 = 14.72$ units

Compute MAD and MSE from the following data of a regression line projection:

Period	Forecast Values	Actual Values
1	410	406
2	419	423
3	428	423
4	435	440

$$\text{MAD} = \frac{\Sigma|Actual - Forecast|}{n} = \frac{|406-410|+|423-419|+|423-428|+|440-435|}{4} = \frac{18}{4} = 4.5$$

$$\text{MSE} = \frac{\Sigma(Forecast\ Errors)^2}{n} = \frac{4^2+4^2+5^2+5^2}{4} = 20.5$$

Inventory Model

Annual demand for a product is 5000 units; holding cost is $50 per unit per year. Setup cost is $30 per order; and lead time has a 10 day average. Suppose there are 250 working days per year.

a) What is the EOQ?

$Q_{opt} = \sqrt{2SD/H}$

$= \sqrt{2(30)(5000)/(50)}$

$= \sqrt{6000}$

= 77.46 = 78 units

b) What is the avg. inventory?

= Q/2

= 78/2 = 39 units

c) What is the optimal number of orders to place in a year?

= D/Q

= 5000/78

= 64.1 = 65

d) What is the optimal number of working days between any two orders?

= Number of working days / Expected number of orders

= 250 days / 65

= 3.85 days

e) What is the total annual cost?

$$TC = \frac{D}{Q} S + \frac{Q}{2} H$$

$$TC = \frac{5000}{78}(30) + \frac{78}{2}(50) = \$3873.08$$

f) What is the ROP?

ROP = D * LT

= 5000 * 10/250

= 200

Demand during lead time for a product follows a normal distribution with a mean of 36 and a standard deviation of 15. What safety stock should be kept to achieve a 90% service level? What is the ROP?

z = 1.28

SS = 1.28 * 15 = 19.22

ROP = 36 + 19.22 = 55.22

Kristen sells pies for $10 each. Unsold pies are sold at a 50% discount. The cost for each pie is $6, and demand follows a normal distribution with a mean of 25 and s.d. of 4.

What is the optimal stocking level?

Service level = 4 / (4+1) = 0.8

Z-score(0.8)=0.84

Optimal stocking level = 25 + 0.84(4) = 28.36 = 29 pies

A company sells 20000 tires each year. The setup cost is $40 per order. The holding cost is $20% of the purchase price of each tire. The purchase price varies according the quantity below. How many tires should the company order each time?

Quantity	Purchase Price per Tire
Less than 500	$20
500 or more, but less than 1000	$18
1000 or more	$17

Q_{opt} at $20 $= \sqrt{2SD/H}$

$$= \sqrt{\frac{2(40)(20000)}{0.2*20}} = 632.46$$

Q_{opt} at $18 $= \sqrt{\frac{2(40)(20000)}{0.2*18}}$ **= 666.67** This one is in the quantity range.

Q_{opt} at $17 $= \sqrt{\frac{2(40)(20000)}{0.2*17}} = 685.99$

The daily demand for 52" flat-screen TVs is normally distributed, with an average of 5 and a standard deviation of 2 units. The lead time for receiving a shipment of new TVs is 10 days and is constant. Determine the reorder point and safety stock for a 95% service level

ROP = (Average daily demand X Lead time in days) + $Z\sigma_{dLT}$

Where $\sigma_{dLT}=\sigma_d\sqrt{Lead\ time}$

So, with Z = 1.65 ← confidence of 95%

ROP = (5 X 10) +1.65(2)$\sqrt{10}$ = 50+10.4 = 60.4 = 61 TVs

Safety stock is 10.4 or 11 TVs

The KEY Electronics store purchases calculators from the manufacturer at $4 per unit. The setup cost is $75 per order, and holding cost is based on a 20% annual interest rate. Finally, the shortage cost per unit of stockout is $25. Expected annual demand is 624 units, demand during the delivery lead-time from the manufacturer to the KEY Electronics store is normally distributed with a mean of 36 and variance of 48.

a) Find the EOQ for the KEY Electronics assuming that there is no shortage cost.

EOQ = $\sqrt{(2)(75)(624)/(0.2)(4)}$

b) Find the optimal (Q,r) policy, where the safety stock is chosen to minimize the expected sum of holding sot and shortage cost.(Hint: use the newsvendor model for each order cycle to determine Z).

The unit overage cost is the unit holding cost during one cycle, which is C_o = H x $\frac{Q}{D}$ = 20% x 4 x $\frac{342}{624}$ =$0.438, (Q/$D$ *is the cycle time*); whereas the unit underage cost is the unit shortage cost in one cycle, which is $25. So the critical ratio $\frac{Cu}{Co+Cu}$ = 25/(25+0.438) = 0.9825. The z-score of 98.25% is 2.1106. So the safety stock is $SS = Z\sigma LT$ = 2.1106 $*$ $\sqrt{48}$=14.6.

Thus, Q=342, r=SS+μLT = 50.6