

Decision Making for Managers

Final Project

Case Study on Forecasting Airport Passenger Arrivals

Using Microsoft Excel

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Case Study: Forecasting Airport Passenger Arrivals

- In the process of ensuring airline security, airports have faced the problem of long waiting lines and waiting times at security gates.
- In their efforts to reduce waiting lines and times, or at least to not have them become longer as airline demand increases, airports have analyzed their existing security systems and sought quantitative solutions.
- Berry International Airport (BEI), is facing issues with the staffing and security check points.
- There are two main concourses at BEI, North and South, each serving different airlines.

Objective

- BEI is having problems with the long waiting lines and times specially in the airport's busiest travel moth of the year July.
- The arrival of passengers has increased in the past 3 years. This data has been tracked.
- Forecast the airport passenger arrival for the 4th year at the South concourse at BEI.

Parameters

- Passenger arrival at South concourse in 2-hour segments from 4:00 AM to 10:00 PM.
- 10 days (selected randomly) for past 3 years.
- For the busiest travel month of the year, July.

Data Table – Passenger Arrival data

| | DAY | 4-6 AM | 6-8 AM | 8-10 AM | 10-12 PM | 12-2 PM | 2-4 PM | 4-6 PM | 6-8 PM | 8-10 PM |
|---------------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|
| Year 1 | 1 | 2400 | 2700 | 3200 | 1400 | 1700 | 1800 | 1600 | 800 | 200 |
| | 2 | 1900 | 2500 | 3100 | 1600 | 1800 | 2000 | 1800 | 900 | 300 |
| | 3 | 2300 | 3100 | 2500 | 1500 | 1500 | 1800 | 1900 | 1100 | 200 |
| | 4 | 2200 | 3200 | 3100 | 2200 | 1900 | 2400 | 2100 | 1200 | 400 |
| | 5 | 2400 | 3300 | 3400 | 1700 | 2200 | 2100 | 2000 | 1000 | 600 |
| | 6 | 2600 | 2800 | 3500 | 1500 | 1700 | 1900 | 1500 | 1100 | 300 |
| | 7 | 1900 | 2800 | 3100 | 1200 | 1500 | 2000 | 1400 | 900 | 400 |
| | 8 | 2000 | 2700 | 2500 | 1500 | 2000 | 2300 | 1900 | 1000 | 200 |
| | 9 | 2400 | 3200 | 3600 | 1600 | 2100 | 2500 | 1800 | 1400 | 200 |
| | 10 | 2600 | 3300 | 3100 | 200 | 2500 | 2600 | 2400 | 1100 | 400 |
| Year 2 | 11 | 3100 | 3900 | 4100 | 2200 | 2600 | 2300 | 2500 | 1100 | 300 |
| | 12 | 2800 | 3400 | 3900 | 1900 | 2100 | 2500 | 2000 | 1200 | 300 |
| | 13 | 2700 | 3800 | 4300 | 2100 | 2400 | 2400 | 2400 | 1200 | 400 |
| | 14 | 2400 | 3500 | 4100 | 2400 | 3000 | 3200 | 2600 | 1200 | 700 |
| | 15 | 3300 | 3700 | 4000 | 2600 | 2600 | 2700 | 2900 | 1000 | 300 |

| | DAY | 4-6 AM | 6-8 AM | 8-10 AM | 10-12 PM | 12-2 PM | 2-4 PM | 4-6 PM | 6-8 PM | 8-10 PM |
|---------------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------------|
| Year 2 | 16 | 3500 | 4000 | 3800 | 2300 | 2700 | 3100 | 3000 | 900 | 200 |
| | 17 | 2900 | 4100 | 3900 | 2400 | 3000 | 3200 | 2500 | 1100 | 500 |
| | 18 | 3400 | 3800 | 4200 | 2000 | 2500 | 3000 | 2200 | 1000 | 300 |
| | 19 | 3600 | 3600 | 4000 | 2300 | 2600 | 2800 | 2600 | 1200 | 200 |
| | 20 | 3700 | 3700 | 4000 | 2200 | 2600 | 2700 | 2400 | 1200 | 200 |
| Year 3 | 21 | 4400 | 4400 | 4500 | 2600 | 3300 | 3400 | 3000 | 1200 | 400 |
| | 22 | 4200 | 4500 | 4300 | 2500 | 3400 | 3600 | 3100 | 1400 | 300 |
| | 23 | 4500 | 4500 | 4700 | 2700 | 3400 | 3500 | 2900 | 1200 | 300 |
| | 24 | 4600 | 4600 | 4600 | 2500 | 3200 | 3500 | 2800 | 1300 | 300 |
| | 25 | 4500 | 4300 | 4400 | 2900 | 3300 | 3300 | 3300 | 1500 | 400 |
| | 26 | 4200 | 4300 | 4500 | 3000 | 4000 | 3400 | 3000 | 1500 | 600 |
| | 27 | 4500 | 4500 | 5100 | 3300 | 4000 | 3700 | 3100 | 1200 | 300 |
| | 28 | 4300 | 4200 | 4300 | 2800 | 3500 | 4000 | 3300 | 1100 | 400 |
| | 29 | 4900 | 4100 | 4200 | 3100 | 3600 | 3900 | 3400 | 1400 | 500 |
| | 30 | 4700 | 4500 | 4100 | 3000 | 4000 | 3700 | 3400 | 1200 | 500 |

Analysis

- The forecast for the next year July can be calculated using the Time Series Analysis method.
- This can be done through the Moving Average method of forecasting.
- Moving average uses values from the recent past to develop forecasts.

The formula for Moving Average (MA):

$$MA_n = \frac{\sum_{i=1}^n D_i}{n}$$

where

n = number of period in the moving average

D_i = data in period i

Time Series Method

The following is the table of passengers for the month of July calculated through moving average method using Excel.

| DAY | 4-6 AM | 6-8 AM | 8-10 AM | 10-12 PM | 12-2 PM | 2-4 PM | 4-6 PM | 6-8 PM | 8-10 PM |
|-----|--------|--------|---------|----------|---------|--------|--------|--------|---------|
| 1 | 2200 | 2767 | 2933 | 1500 | 1667 | 1867 | 1767 | 933 | 233 |
| 2 | 2133 | 2933 | 2900 | 1767 | 1733 | 2067 | 1933 | 1067 | 300 |
| 3 | 2300 | 3200 | 3000 | 1800 | 1867 | 2100 | 2000 | 1100 | 400 |
| 4 | 2400 | 3100 | 3333 | 1800 | 1933 | 2133 | 1867 | 1100 | 433 |
| 5 | 2300 | 2967 | 3333 | 1467 | 1800 | 2000 | 1633 | 1000 | 433 |
| 6 | 2167 | 2767 | 3033 | 1400 | 1733 | 2067 | 1600 | 1000 | 300 |
| 7 | 2100 | 2900 | 3067 | 1433 | 1867 | 2267 | 1700 | 1100 | 267 |
| 8 | 2333 | 3067 | 3067 | 1100 | 2200 | 2467 | 2033 | 1167 | 267 |
| 9 | 2700 | 3467 | 3600 | 1333 | 2400 | 2467 | 2233 | 1200 | 300 |
| 10 | 2833 | 3533 | 3700 | 1433 | 2400 | 2467 | 2300 | 1133 | 333 |
| 11 | 2867 | 3700 | 4100 | 2067 | 2367 | 2400 | 2300 | 1167 | 333 |
| 12 | 2633 | 3567 | 4100 | 2133 | 2500 | 2700 | 2333 | 1200 | 467 |
| 13 | 2800 | 3667 | 4133 | 2367 | 2667 | 2767 | 2633 | 1133 | 467 |
| 14 | 3067 | 3733 | 3967 | 2433 | 2767 | 3000 | 2833 | 1033 | 400 |
| 15 | 3233 | 3933 | 3900 | 2433 | 2767 | 3000 | 2800 | 1000 | 333 |

| DAY | 4-6 AM | 6-8 AM | 8-10 AM | 10-12 PM | 12-2 PM | 2-4 PM | 4-6 PM | 6-8 PM | 8-10 PM |
|-----|--------|--------|---------|----------|---------|--------|--------|--------|---------|
| 16 | 3267 | 3967 | 3967 | 2233 | 2733 | 3100 | 2567 | 1000 | 333 |
| 17 | 3300 | 3833 | 4033 | 2233 | 2700 | 3000 | 2433 | 1100 | 333 |
| 18 | 3567 | 3700 | 4067 | 2167 | 2567 | 2833 | 2400 | 1133 | 233 |
| 19 | 3900 | 3900 | 4167 | 2367 | 2833 | 2967 | 2667 | 1200 | 267 |
| 20 | 4100 | 4200 | 4267 | 2433 | 3100 | 3233 | 2833 | 1267 | 300 |
| 21 | 4367 | 4467 | 4500 | 2600 | 3367 | 3500 | 3000 | 1267 | 333 |
| 22 | 4433 | 4533 | 4533 | 2567 | 3333 | 3533 | 2933 | 1300 | 300 |
| 23 | 4533 | 4467 | 4567 | 2700 | 3300 | 3433 | 3000 | 1333 | 333 |
| 24 | 4433 | 4400 | 4500 | 2800 | 3500 | 3400 | 3033 | 1433 | 433 |
| 25 | 4400 | 4367 | 4667 | 3067 | 3767 | 3467 | 3133 | 1400 | 433 |
| 26 | 4333 | 4333 | 4633 | 3033 | 3833 | 3700 | 3133 | 1267 | 433 |
| 27 | 4567 | 4267 | 4533 | 3067 | 3700 | 3867 | 3267 | 1233 | 400 |
| 28 | 4633 | 4267 | 4200 | 2967 | 3700 | 3867 | 3367 | 1233 | 467 |
| 29 | 4800 | 4300 | 4150 | 3050 | 3800 | 3800 | 3400 | 1300 | 500 |
| 30 | 4700 | 4500 | 4100 | 3000 | 4000 | 3700 | 3400 | 1200 | 500 |

Conclusion

- From the table in the previous slides, it is observed that the arrival of the passengers at the South concourse, is more between 4:00 AM to 10:00 AM.
- Therefore, a greater number of checkpoints are necessary during this time.