Week 1 assignment

Business

The following gives the number of pints of type A blood used at Woodlawn Hospital in the past 6 weeks: Week Of Pints Used August 31 360 September 7389

September 14

410

September 21

381

September 28

368

October 5

374

a) Forecast the demand for the week of October 12 using a 3-week moving average.

[381+368+374]/3 = 374. 33 pints

b) Use a 3-week weighted moving average, with weights of . 1, . 3, and . 6, using . 6 for the most recent week. Forecast demand for the week of October 12.

381*0. 1

38. 1

368*0. 3

110. 4

374*0. 6

224. 4

Forecast (October 12).

372. 9

c) Compute the forecast for the week of October 12 using exponential smoothing with a forecast for August 31 of 360 andα = . 2.

Week Of

Pints Used

Forecast

Forecasting error

Error*0. 20

Forecast

August 31

360

360

0

0

360

September 7

389

360

29

5. 8

365. 8

September 14

410

365. 8

44. 2

8. 84

374. 64

September 21

381

374. 64

6. 36

1. 272

375. 912

September 28

368

375. 912

-7. 912

-1. 5824

374. 3296

October 5

374

374. 32296

-0. 3296

-0. 06592

374. 2636

The Carbondale Hospital is considering the purchase of a new ambulance. The decision will rest partly on the anticipated mileage to be driven next year. The miles driven during the past 5 years are as follows:

Year

Mileage

1

3, 000

2

4, 000

3

3, 400

4

3, 800

5

3, 700

*Note: means the problem may be solved with POM for Windows and/or Excel OM.

a. Forecast the mileage for next year using a 2-year moving average.

[3, 700+3, 800]/2 = 3, 750 ml.

b. Find the MAD based on the 2-year moving average forecast in part (a). (Hint: You will have only 3 years of matched data.)

Year

Mileage

Two-year Moving Average

Error

/error/

1

3, 000

2

4, 000

3

3, 400

3, 500

-100

100

4

3, 800

3, 700

100

100

5

3, 700

3, 600

100

100

Totals

100

100

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0question_20. pdfAD = 300/3 = 100

c. Use a weighted 2-year moving average with weights of . 4 and . 6 to forecast next year’s mileage. (The weight of . 6 is for the most recent year.) What MAD results from using this approach to forecasting? (Hint: You will have only 3 years of matched data.)

Year

Mileage

Forecast

Error

/error/

1

3, 000

2

4, 000

3

3, 400

3, 600

-200

200

4

3, 800

3, 640

160

160

5

3, 700

3, 640

60

60

420

Forecasting for year 6 = 3, 740

MAD = 140[420/3]

d. Compute the forecast for year 6 using exponential smoothing, an initial forecast for year 1 of 3, 000 miles, and α = . 5.

Year

Mileage

Forecast

Forecast Error

Error*0. 50

New Forecast

1

3, 000

3, 000

0

0

3, 000

2

4, 000

3, 000

1, 000

500

3, 500

3

3, 400

3, 600

-100

-50

3, 450

4

3, 800

3, 640

350

175

3, 625

5

3, 700

3, 640

75

38

3, 663

Total

1, 325

Therefore, forecast = 3, 663 miles.

4. 9

Dell uses the CR5 chip in some of its laptop computers. The prices for the chip during the past 12 months were as follows:

Month

Price per Chip

Month

Price per Chip

January

$1. 80

July

1. 80

February

1. 67

August

1. 83

March

1. 70

September

1. 70

April

1. 85

October

1. 65

May

1. 90

November

1. 70

June

1. 87

December

1. 75

a) Use a 2-month moving average on all the data and plot the averages and the prices.

Month

Price per Chip ($)

2-month moving average

January

1. 8

February

1. 67

March

1. 7

1. 735

April

1. 85

1. 685

May

1. 9

1. 775

June

1. 87

1. 875

July

1. 8

1. 885

August

1. 83

1. 835

September

1. 7

1. 815

October

1. 65

1. 765

November

1. 7

1. 675

December

1. 75

1. 675

b) Use a 3-month moving average and add the 3-month plot to the graph created in part (a).

Month

Price per Chip ($)

3-month moving average

January

1. 8

February

1. 67

March

1. 7

April

1. 85

1. 72

May

1. 9

1. 74

June

1. 87

1. 82

July

1. 8

1. 87

August

1. 83

1. 86

September

1. 7

1. 83

October

1. 65

1. 78

November

1. 7

1. 73

December

1. 75

1. 68

December + 1 Month

1. 70

c) Which is better (using the mean absolute deviation): the 2-month average or the 3-month average?

Month

Price per Chip ($)

2-month moving average

Error

Absolute

January

1. 8

February

1. 67

March

1. 7

1. 735

-0. 035

0. 03

April

1. 85

1. 685

0. 165

0. 17

May

1. 9

1. 775

0. 125

0. 13

June

1. 87

1. 875

-0. 005

0. 00

July

1. 8

1. 885

-0. 085

0. 09

August

1. 83

1. 835

-0. 005

0. 00

September

1. 7

1. 815

-0. 115

0. 12

October

1. 65

1. 765

-0. 115

0. 12

November

1. 7

1. 675

0. 025

0. 03

December

1. 75

1. 675

0. 075

0. 08

MAD

0. 08

Month

Price per Chip ($)

3-month moving average

Error

Absolute

January

1. 8

February

1. 67

March

1. 7

April

1. 85

1. 72

0. 13

0. 13

May

1. 9

1. 74

0. 16

0. 16

June

1. 87

1. 82

0. 05

0. 05

July

1. 8

1. 87

-0. 07

0. 07

August

1. 83

1. 86

-0. 03

0. 03

September

1. 7

1. 83

-0. 13

0. 13

October

1. 65

1. 78

-0. 13

0. 13

November

1. 7

1. 73

-0. 03

0. 03

December

1. 75

1. 68

0. 07

0. 07

MAD

0. 09

The 2-month average is better because it has a lower MAD, hence more accurate.

d) Compute the forecasts for each month using exponential smoothing, with an initial forecast for January of $1. 80. Use α = . 1, then α = . 3, and finally α = . 5. Using MAD, which α is the best?

Month

Price per Chip ($)

Forecast using exponential smoothing (alpha = 0. 1)

Error

Absolute

January

1. 8

1. 8

0. 00

0. 000

February

1. 67

1. 8

-0. 13

0. 130

March

1. 7

1. 79

-0. 09

0. 087

April

1. 85

1. 78

0. 07

0. 072

May

1. 9

1. 79

0. 11

0. 115

June

1. 87

1. 80

0. 07

0. 073

July

1. 8

1. 80

0. 00

0. 004

August

1. 83

1. 80

0. 03

0. 026

September

1. 7

1. 81

-0. 11

0. 106

October

1. 65

1. 80

-0. 15

0. 146

November

1. 7

1. 78

-0. 08

0. 081

December

1. 75

1. 77

-0. 02

0. 023

MAD

0. 072

Month

Price per Chip ($)

Forecast using exponential smoothing (alpha = 0. 3)

Error

Absolute

January

1. 8

1. 8

0. 00

0. 000

February

1. 67

1. 8

-0. 13

0. 130

March

1. 7

1. 76

-0. 06

0. 061

April

1. 85

1. 74

0. 11

0. 107

May

1. 9

1. 77

0. 13

0. 125

June

1. 87

1. 81

0. 06

0. 058

July

1. 8

1. 83

-0. 03

0. 030

August

1. 83

1. 82

0. 01

0. 009

September

1. 7

1. 82

-0. 12

0. 124

October

1. 65

1. 79

-0. 14

0. 136

November

1. 7

1. 75

-0. 05

0. 046

December

1. 75

1. 73

0. 02

0. 018

MAD

0. 070

Month

Price per Chip ($)

Forecast using exponential smoothing (alpha = 0. 5)

Error

Absolute

January

1. 8

1. 8

0. 00

0. 000

February

1. 67

1. 8

-0. 13

0. 130

March

1. 7

1. 74

-0. 03

0. 035

April

1. 85

1. 72

0. 13

0. 133

May

1. 9

1. 78

0. 12

0. 116

June

1. 87

1. 84

0. 03

0. 028

July

1. 8

1. 86

-0. 06

0. 056

August

1. 83

1. 83

0. 00

0. 002

September

1. 7

1. 83

-0. 13

0. 129

October

1. 65

1. 76

-0. 11

0. 114

November

1. 7

1. 71

-0. 01

0. 007

December

1. 75

1. 70

0. 05

0. 046

MAD

0. 066

The Forecast using exponential smoothing using alpha = 0. 5 is better because it has the lowest MAD (Abraham & Leddolter, 2005).

4. 11

a) Use exponential smoothing with a smoothing constant of 0. 3 to forecast the registrations at the seminar given in Problem 4. 10. To begin the procedure, assume that the forecast for year 1 was 5, 000 people signing up. (Abraham & Leddolter, 2005).

Year

Registrations (000)

Forecast registrations (‘ 000) using exponential smoothing (alpha = 0. 3)

1

4

5

2

6

4. 7

3

4

5. 09

4

5

4. 76

5

10

4. 83

6

8

6. 38

7

7

6. 87

8

9

6. 91

9

12

7. 54

10

14

8. 87

11

15

10. 41

b) What is the MAD?

Year

Registrations (000)

Forecast registrations (‘ 000) using exponential smoothing (alpha = 0. 3)

Error

Absolute

1

4

5

-1. 00

1. 00

2

6

4. 7

1. 30

1. 30

3

4

5. 09

-1. 09

1. 09

4

5

4. 76

0. 24

0. 24

5

10

4. 83

5. 17

5. 17

6

8

6. 38

1. 62

1. 62

7

7

6. 87

0. 13

0. 13

8

9

6. 91

2. 09

2. 09

9

12

7. 54

4. 46

4. 46

10

14

8. 87

5. 13

5. 13

11

15

10. 41

4. 59

4. 59

MAD

2. 44

Reference

Abraham, B., & Leddolter, J. (2005). Statistical Methods for Forecasting. New York: Wiley.