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(4 points) Write an Excel spreadsheet to forecast the next period with exponential smoothing. For the demand, use the digits of π as the data set. So, demand over 100 periods is as follows:

3 1 4 1 5 9 2 6 5 3 5 8 9 7 9 3 2 3 8 4 6 2 6 4 3 3 8 3 2 7 9 5 0 2 8 8 4 1 9 7 1 6 9 3 9 9 3 7 5 1 0 5 8 2 0 9 7 4 9 4 4 5 9 2 3 0 7 8 1 6 4 0 6 2 8 6 2 0 8 9 9 8 6 2 8 0 3 4 8 2 5 3 4 2 1 1 7 0 6 7

Use α = 0.1, so you weight the yesterday’s demand value with α = 0.1 and yesterday’s forecast with 1 – α = 0.9 to forecast today’s demand. Use the first value of 3 as the initial forecast.

Calculate the total mean absolute error.

表格

描述已自动生成

(4 points) Create another an Excel spreadsheet to forecast the next period with exponential smoothing. For the demand, use the digits of π multiplied by 10. So, demand over 100 periods is as follows: 30 10 40 10 50 90 … Use α = 0.1 as in the previous question. Use the first value of 30 as the initial forecast.

Calculate the total mean absolute error.

表格

描述已自动生成

Compared to the previous question, is the error smaller, the same, or larger than the previous data set? Is exponential smoothing producing a worse forecast than in the previous data set? Explain.

By comparing these two datasets, we can find that the MAE of the "π multiplied by 10" group is larger than that of the π group. However, it doesn't produce a worse forecast than in the previous dataset. It's just because the demand value is much larger than the previous one. In this case, we can use mean absolute percentage error to eliminate the difference of demand.

(4 points) a. For both data sets, find a value of α which minimizes total mean absolute error. You can do this by hand, or you can use Excel’s Solver function to find it for you.

表格, Excel

描述已自动生成表格

描述已自动生成

b. Modify your spreadsheets, so the initial forecast is an input. For both data sets, optimize both α and the initial forecast to minimize total mean absolute error. What is the total mean absolute error?

表格

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(4 points) Write an Excel spreadsheet to forecast the next period using exponential smoothing with a trend. For the demand, use the digits of π plus the period number starting at period zero. So, demand over 100 periods is as follows: 0+3 1+1 2+4 3+1 4+5 5+9 6+2 7+6 …

Starting with α = 0.1 and β =0.1 (so you weight yesterday’s trend with 0.9), calculate the total mean absolute error.

Here, we just use the naïve average for the forecast constant, which is 3. And we also use 3 for the trend value to decrease the steep change at the beginning. And in this case, the total MAE is 9.044

表格

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Optimize the initial forecast, the initial trend, α, and β to minimize total mean absolute error.

图形用户界面, 应用程序, 表格, Excel

描述已自动生成

(4 points) Write an Excel spreadsheet to forecast the next period with exponential smoothing. For the demand, use the original data set with every 10th value multiplied by 100:

3 1 4 1 5 9 2 6 5 300 5 8 9 7 9 3 2 3 8 400 6 2 6 4 3 3 8 3 2 700 9 5 0 2 8 8 4 1 9 700 1 6 9 3 9 9 3 7 5 100 0 5 8 2 0 9 7 4 9 400 4 5 9 2 3 0 7 8 1 600 4 0 6 2 8 6 2 0 8 900 9 8 6 2 8 0 3 4 8 200 5 3 4 2 1 1 7 0 6 700

Optimize α and the initial forecast to minimize mean absolute error. Create a graph of the data and your forecast.

图形用户界面, 应用程序, 表格, Excel

描述已自动生成图表, 散点图

描述已自动生成

What could be going on in the business operations to produce this kind of data? Do you think exponential smoothing is appropriate for this data set? What should the manager do?

There were some extreme values in demand that lead the forecast far below than the forecast error, so I think exponential smoothing is not suitably apply to this data set. Manager could do ABC analysis on customers and find who makes the huge orders. By extracting all the predictable variability from the data, in this case we could find out the pattern that each 10th period would have a huge increase on demand. To deal with this problem, manager could also work closely with large customer to coordinate orders, or to assign a customer rep to handle the operation issue.