Forecasting

3/3 points (100.00%)

Quiz, 3 questions

✔ **Congratulations! You passed!**

<div>Next Item</div>

✔   1 / 1
points

1.

Let's take a look at the data set called *sunspots* (time series spotted below)*.*
There isn't much of an apparent trend, but the series certainly seems to
exhibit seasonality.

*Monthly mean relative sunspot numbers from 1749 to 1983. Andrews, D. F.
and Herzberg, A. M. (1985) Data: A Collection of Problems from Many Fields
for the Student and Research Worker. New York: Springer-Verlag.*

_**1750**_   _**1000**_   _**1050**_   _**1000**_   _**1000**_
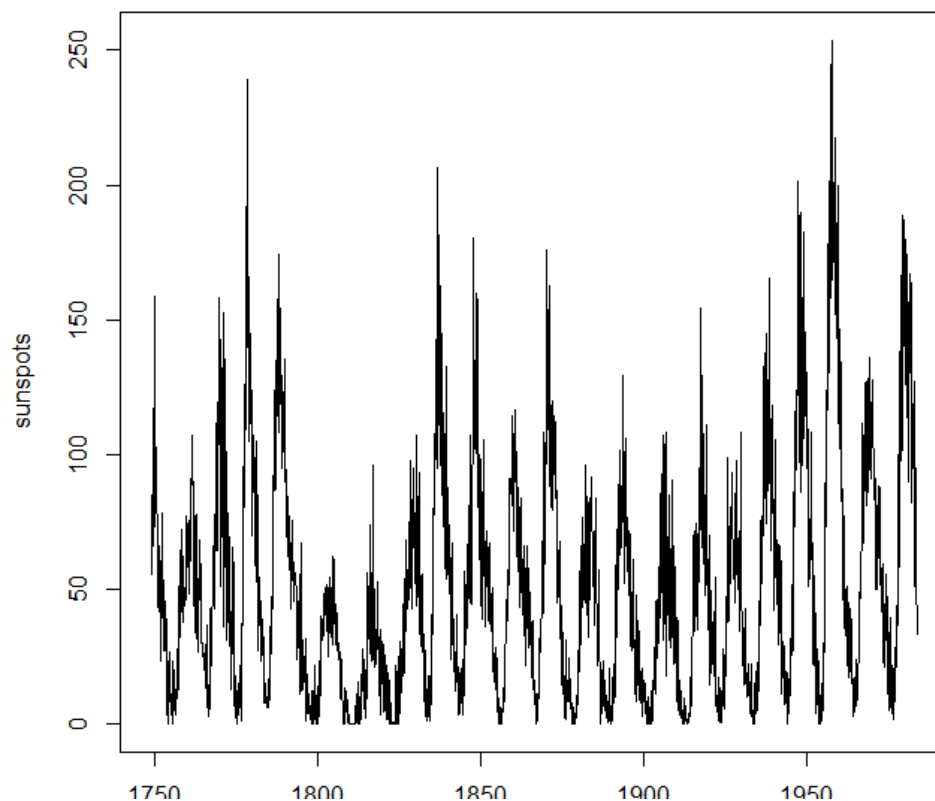
Time

Forecasting   **3/3 points (100.00%)**

Quiz, 3 questions   The last observation is for December 1983. What is your forecast for January
1984?

Please use the following code to produce your coefficients. Recall our
notation and method:

$$\hat{x}_{n+h} = level_n + h * trend_n + seasonal_{n+h-m}$$

```
1   m<-HoltWinters(sunspots)
2   x=m$coefficients
3   x[['a']] + 1*x[['b']]+x[['s1']]
```

Run

Reset

```
[1] 32.14241
```

⊙   32.14241

Correct
That's right! We use

$$\hat{x}_{n+h} = level_n + h * trend_n + seasonal_{n+h-m}$$

Our output gives us $a = 44.44311347$, $b = -0.01320934$, and
$s1 = -12.28749771$. We also know the number of steps into the
future $h = 1$ so we arrive at

$$\hat{x}_{2820+1} = level_{2820} + 1 * trend_{2820} + seasonal_{2820+1-12}$$

$$\hat{x}_{2820+1} = 44.44311347 + 1 * -0.01320934 + -12.28749771$$

$$\hat{x}_{2820+1} = 32.14241$$

Forecasting

Quiz, 3 questions

◯ 44.44311347

3/3 points (100.00%)

✔   1 / 1
         points

2.

Let's stay with the data set called *sunspots.*

Forecasting

Monthly mean relative sunspot numbers from 1749 to 1983. Andrews, D. F. and **3/3 points (100.00%)**

Quiz, 3 questions

Herzberg, A. M. (1985) Data: A Collection of Problems from Many Fields for the Student and Research Worker. New York: Springer-Verlag.

What is your forecast (using HoltWinters()) for April 1984?

```
1  library(forecast)
2  forecast.HoltWinters( HoltWinters(sunspots) )
```

[Run]

Reset

```
          Point Forecast      Lo 80      Hi 80        Lo 95      Hi 95
Jan 1984        32.14241  10.548026   53.73679   -0.8833483   65.16816
Feb 1984        37.15754  13.145674   61.16941    0.4345577   73.88053
Mar 1984        33.30251   7.089819   59.51520   -6.7863413   73.39136
Apr 1984        35.85609   7.608549   64.10362   -7.3447930   79.05696
May 1984        37.03795   6.887910   67.18799   -9.0725564   83.14845
Jun 1984        36.95406   5.010205   68.89792  -11.8998514   85.80797
Jul 1984        38.27081   4.624430   71.91720  -13.1868893   89.72852
Aug 1984        38.81132   3.540472   74.08217  -15.1307873   92.75343
Sep 1984        48.08281  11.255227   84.91040   -8.2401190  104.40575
Oct 1984        42.35443   4.029575   80.67929  -16.2583776  100.96724
Nov 1984        31.53176  -8.237619   71.30114  -29.2902560   92.35378
Dec 1984        40.92555  -0.241162   82.09226  -22.0335035  103.88461
Jan 1985        31.98389 -11.013743   74.98153  -33.7753176   97.74311
Feb 1985        36.99903  -7.300679   81.29874  -30.7515295  104.74959
Mar 1985        33.14400 -12.423742   78.71174  -36.5458464  102.83384
Apr 1985        35.69757 -11.106920   82.50207  -35.8837223  107.27887
May 1985        36.87944 -11.132959   84.89183  -36.5491857  110.30806
Jun 1985        36.79555 -12.398023   85.98912  -38.4395264  112.03062
Jul 1985        38.11230 -12.237606   88.46221  -38.8912378  115.11584
Aug 1985        38.65281 -12.830275   90.13589  -40.0837726  117.38939
Sep 1985        47.92430  -4.670294  100.51890  -32.5121912  128.36079
Oct 1985        42.19592 -11.489876   95.88171  -39.9094191  124.30126
Nov 1985        31.37325 -23.384651   86.13115  -52.3717312  115.11823
Dec 1985        40.76704 -15.044972   96.57905  -44.5900658  126.12414
```

35.85609

▲

Correct Response

Very good! For April we use

$$\hat{x}_{n+4} = level_n + 4 * trend_n + seasonal_{n+4-12}$$

Forecasting

Quiz, 3 questions

Our output gives us $a = 44.44311347$, $b = -0.01320934$, and $s4 = -8.53419032$. We also know the number of steps into the future $h = 4$ so we arrive at

3/3 points (100.00%)

$$\hat{x}_{2820+1} = 44.44311347 + 4 * -0.01320934 + -8.53419032$$

$$\hat{x}_{2820+1} = 32.14241$$

✔ 1 / 1
points

3.
Again, stay with the data set called sunspots.

Monthly mean relative sunspot numbers from 1749 to 1983. Andrews, D. F. and Herzberg, A. M. (1985) Data: A Collection of Problems from Many Fields for the Student and Research Worker. New York: Springer-Verlag.

Do you forecast that the monthly mean relative sunspot number for August 1985 will be higher or lower than the observed number for August 1983? Note: you can recover the measured value from August 1983 by typing: sunspots on the R command line. You should see the value: August 1983 (71.8)

○ August 1985 is forecast to be higher than August 1983.

◉ August 1985 is forecast to be lower than August 1983.

Correct
Good!

- The measured quantity for August 1983 was 71.8.

- To forecast for August 1985 we use $h = 20$.

- The generic future August has coefficient $s8 = -5.52611868$

So we have

$$44.44311347 + 20 * -0.01320934 + -5.52611868 = 38.65281.$$

This is clearly lower than the observed value in 1983.

Forecasting

3/3 points (100.00%)

Quiz, 3 questions

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