

'BJsales' dataset

12/12 points (100.00%)

Quiz, 12 questions

✓ Congratulations! You passed!

Next Item

1 / 1
points

1.

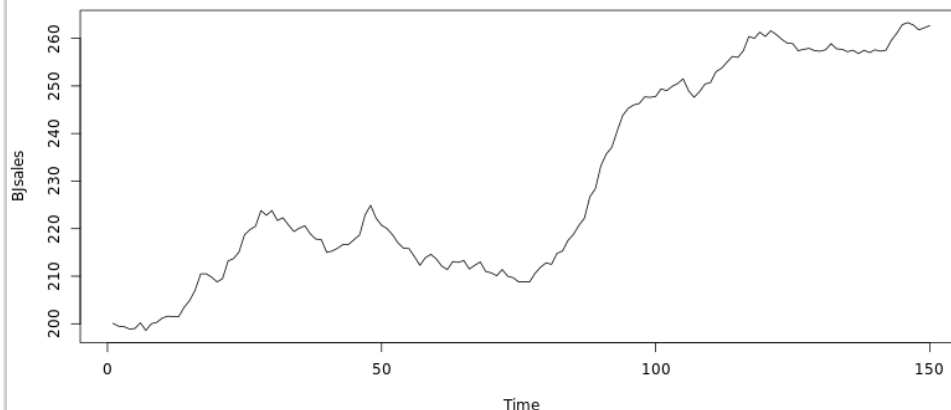
This Quiz has several questions all of which are related and are steps toward modeling the time series titled 'BJsales' in 'datasets' package in R.

Plot the time series in the code block below.

```
1 # Plot time series 'BJsales'  
2 plot(BJsales)
```

Run

Reset



Which one of the following is plausible?



There are ups and downs with a general upward trend.

**Correct**

Correct!



There is no trend at all.



Un-selected is correct

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Time series is not stationary.

**Correct**

Correct!

There is a trend which means mean is changing.

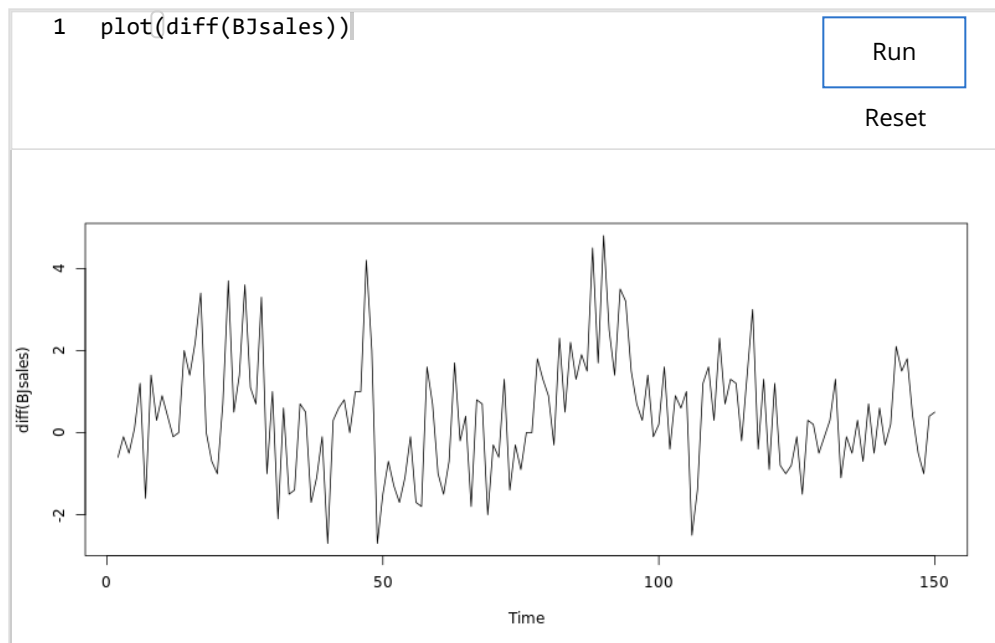


Time series is stationary.

**Un-selected is correct**1 / 1
points

2.

Plot the differenced data below. Does it seem stationary?



It does not seem to be stationary since there are still upward or downward trends in different parts of the time plot.



Correct

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There is, for example, an upward trend between (50,100) but a downward trend between (100,150). That means the mean is changing.



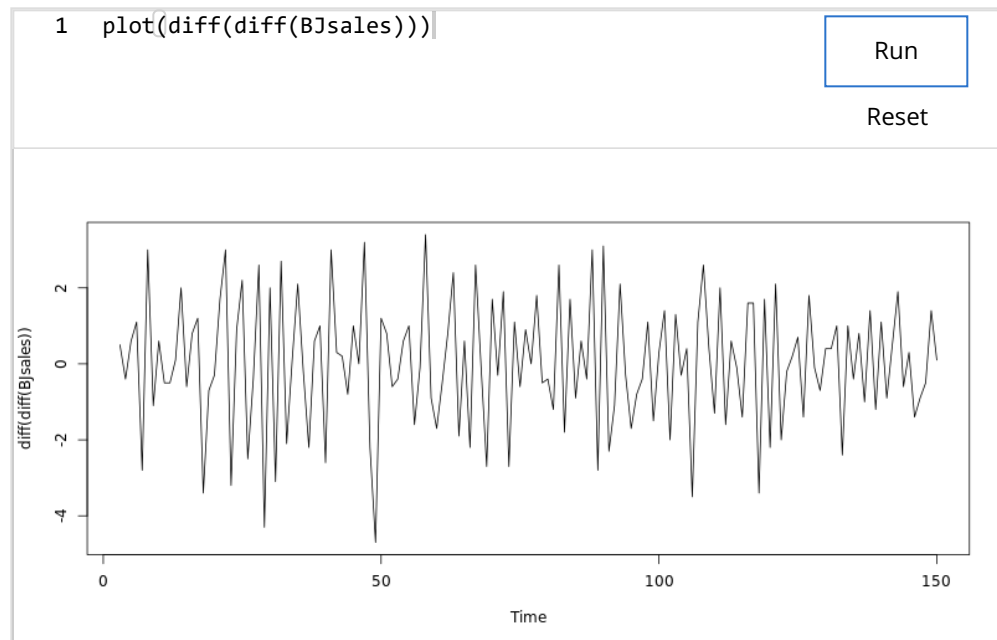
It does seem stationary since there is no general upward or downward trend.



1 / 1
points

3.

To get rid of a still remaining trend, we apply one more differencing. Plot the twice differenced time series in the code block below.



Which one or more of the following are plausible?



Mean level seems to be changing.



Un-selected is correct



There is no systematic change in mean.



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Mean level seems to be constant, around 0.



Variance towards the end of the series seems to be different from the variance in the other parts of the plot.

**Correct**

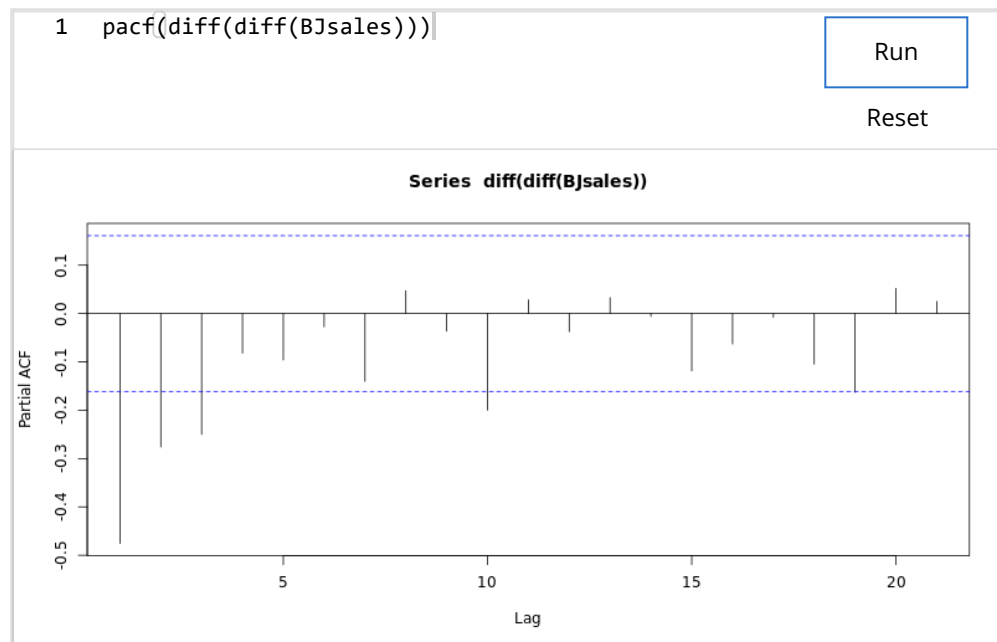
Correct!

It seems that variance is smaller towards the end of the plot. One may say that difference in the change of the variance is not high, and thus can be ignored.

1 / 1
points

4.

Find the PACF of `diff(diff(BJsales))` in the code block below. Which lags are significant?



Lag 1, Lag 2, Lag 3



Lag 1, Lag 8, Lag 11

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Lag 1, Lag 2, Lag 3, Lag 10, Lag 19

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Correct

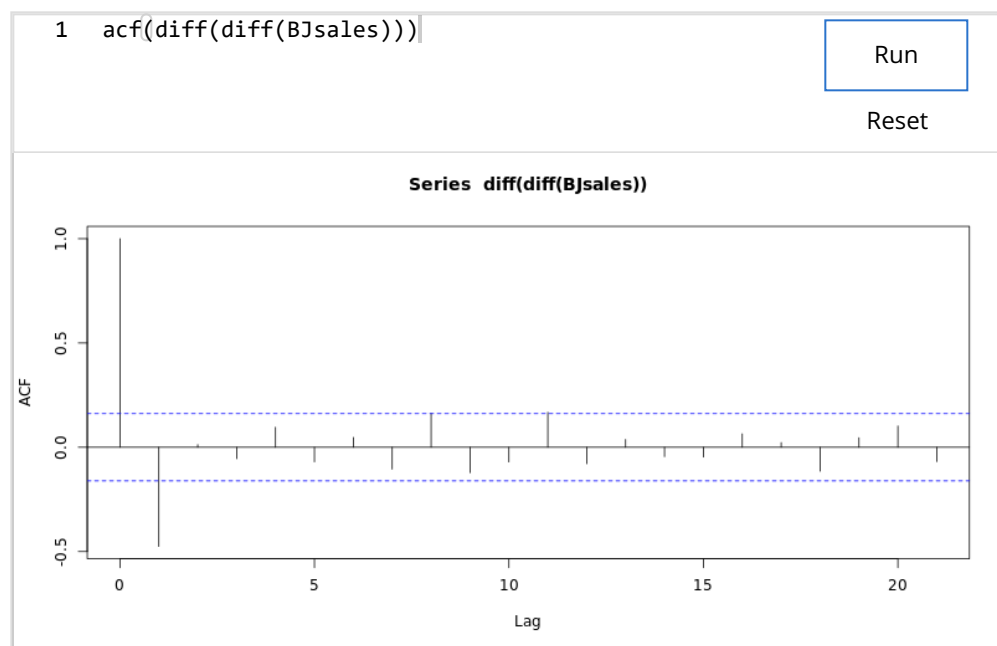
Correct!

One might say that Lag 19 is barely significant.

1 / 1
points

5.

Find the ACF of `diff(diff(BJsales))` in the code block below. Which lags are significant?



Lag 1, Lag 8, Lag 11

Correct

Correct!

Lag 8 and Lag 11 are barely significant.



Lag 1



Lag 1, Lag 2, Lag 3, Lag 10, Lag 19

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1 / 1
points

6.

What does ACF suggest?



Keeping parsimony principle in mind, the order of MA term can be 0 or 1.

**Correct**

Correct!



If we ignore barely significant lags, the order of MA term can be 0 or 1.

**Correct**

Correct!



Keeping parsimony principle in mind, AR term has order of 0 or 1.

**Un-selected is correct**1 / 1
points

7.

What does PACF suggest?



Keeping parsimony principle in mind, the order of AR terms can be 0,1,2 or 3.

**Correct**

Correct!



If we ignore barely significant lags, the order of MA terms can be 0, 1, 2 or 3.

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Un-selected is correct



1 / 1
points

8.

Now we try few different models and compare their AIC values.

```

1  d=2
2  for(p in 1:4){
3    for(q in 1:2){
4      if(p+d+q<=8){
5        model<-arima(x=BJsales, order = c((p-1),d,(q-1)))
6        pval<-Box.test(model$residuals, lag=log(length(model$residuals)))
7        sse<-sum(model$residuals^2)
8        cat(p-1,d,q-1, 'AIC=', model$aic, 'SSE=', sse, 'p-VALUE=', pval$p
          .value, '\n')
9      }
10   }
11 }

```

Run

Reset

```

0 2 0 AIC= 577.6777 SSE= 423.7908 p-VALUE= 7.610494e-07
0 2 1 AIC= 517.1371 SSE= 276.2293 p-VALUE= 0.9632467
1 2 0 AIC= 541.9646 SSE= 327.92 p-VALUE= 0.003606979
1 2 1 AIC= 518.9734 SSE= 275.8554 p-VALUE= 0.941776
2 2 0 AIC= 532.2986 SSE= 302.7467 p-VALUE= 0.05824473
2 2 1 AIC= 520.2684 SSE= 274.0474 p-VALUE= 0.7955439
3 2 0 AIC= 524.7648 SSE= 283.4941 p-VALUE= 0.7035291
3 2 1 AIC= 519.4182 SSE= 264.0684 p-VALUE= 0.6948066

```

Which model has the smallest AIC value?



ARIMA(0,2,1)

Correct

Correct!

Smallest AIC=517.1371



ARIMA(1,2,1)



ARIMA(3,2,1)

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1 / 1
points

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```

1 d=2
2 for(p in 1:4){
3   for(q in 1:2){
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          .value, '\n')
9     }
10  }
11 }

```

```

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3 2 0 AIC= 524.7648 SSE= 283.4941 p-VALUE= 0.7035291
3 2 1 AIC= 519.4182 SSE= 264.0684 p-VALUE= 0.6948066

```

Which model has the smallest SSE (sum of squared errors) value?

☐ ARIMA(0,2,1)☒ ARIMA(3,2,1)**Correct**

Correct!

Smallest SSE value is 264.0684.

☐ ARIMA(1,2,0)1 / 1
points

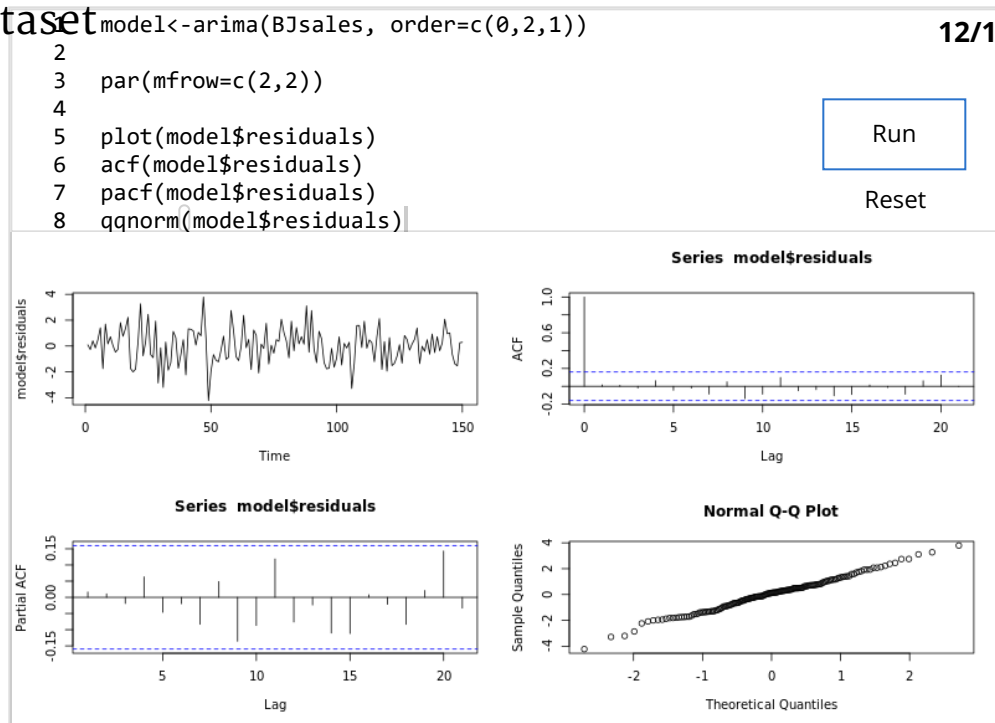
10.

We fit ARIMA(0,2,1), and look at the time plot, ACF and PACF of the residuals.

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Is there compelling evidence against the whiteness of the residuals?

☒ No, since QQ-plot seems linear.

Correct

Correct!

☒ No, since ACF nad PACF has no significant lags.

Correct

Correct!



1 / 1
points

11.

Let $X_t = \text{BJsales}$ and $Y_t = \text{diff}(\text{diff}(\text{BJsales}))$. What is the fitted model for Y_t ?

☒ $Y_t = (1 - 0.7480B)Z_t$ and $\sigma_Z = 1.866$.

Un-selected is correct

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$$Y_t = Z_t - 0.7480Z_{t-1} \text{ and } \sigma_Z = 1.866.$$



Un-selected is correct



$$Y_t = (1 - 0.7480B)Z_t \text{ and } \sigma_Z^2 = 1.866.$$



Correct

Correct!



$$Y_t = Z_t - 0.7480Z_{t-1} \text{ and } \sigma_Z^2 = 1.866.$$



Correct

Correct!

1 / 1
points

12.

Let $X_t = \text{BJsales}$ and $Y_t = \text{diff}(\text{diff}(\text{BJsales}))$. What is the fitted model for X_t ?



$$(1 - 2B + B^2)X_t = (1 - 0.7480B)Z_t \text{ and } \sigma_Z^2 = 1.866.$$



Correct

Correct!

$$\nabla^2 = 1 - 2B + B^2.$$



$$\nabla^2 X_t = Z_t - 0.7480Z_{t-1} \text{ and } \sigma_Z^2 = 1.866.$$



Correct

Correct!

$$1 - B = \nabla.$$



$$X_t = 2X_{t-1} - X_{t-2} + Z_t - 0.7480Z_{t-1} \text{ and } \sigma_Z^2 = 1.866.$$

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Correct

Correct!



$$(1 - B)^2 X_t = Z_t - 0.7480Z_{t-1} \text{ and } \sigma_Z^2 = 1.866.$$

Correct

Correct!

$$Y_t = (1 - B)^2 X_t.$$

