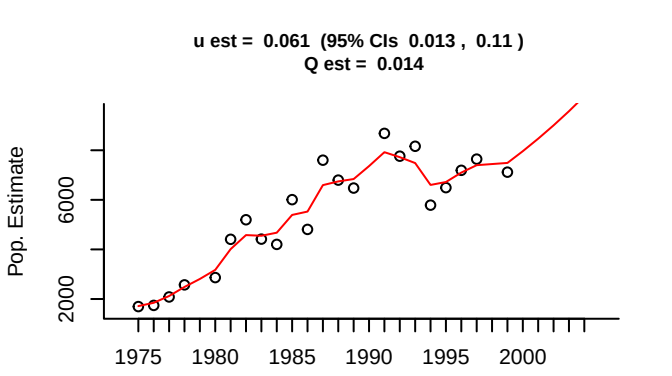
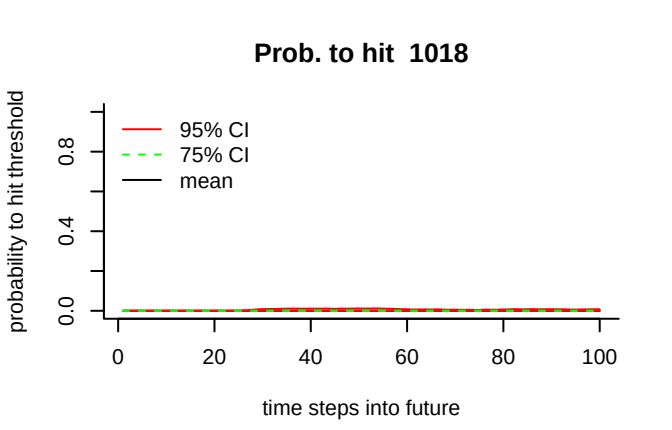
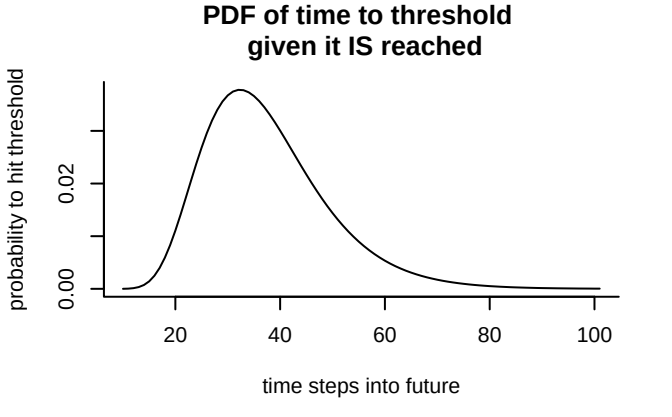
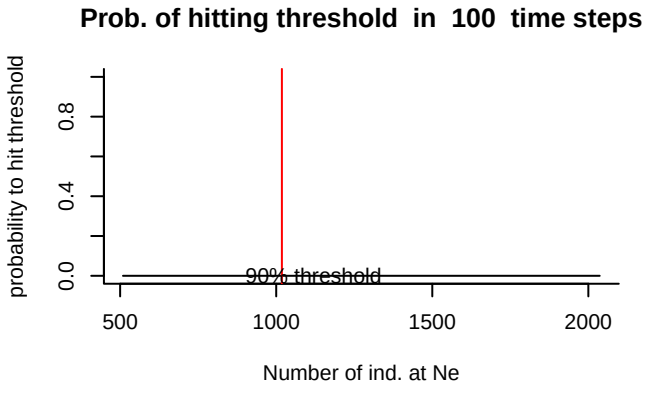
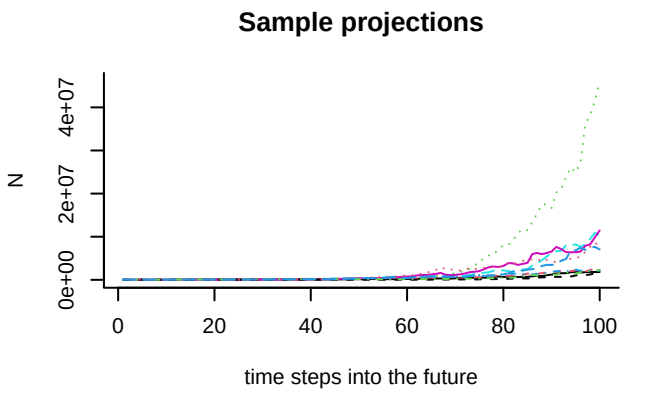
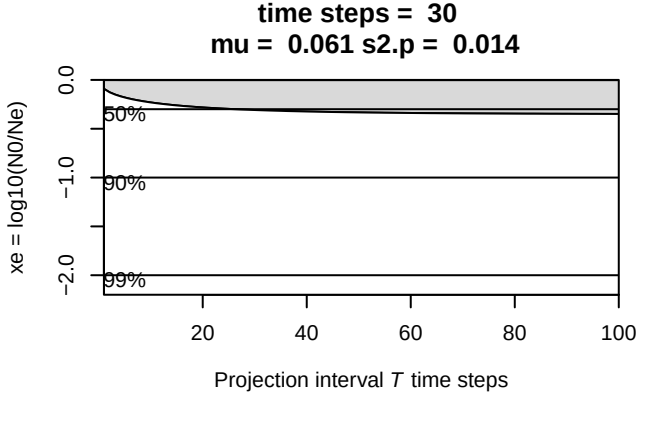

u est = 0.061 (95% CIs 0.013 , 0.11)
Q est = 0.014
Pop. Estimate
2000
6000
1975
1980
1985
1990
1995
2000

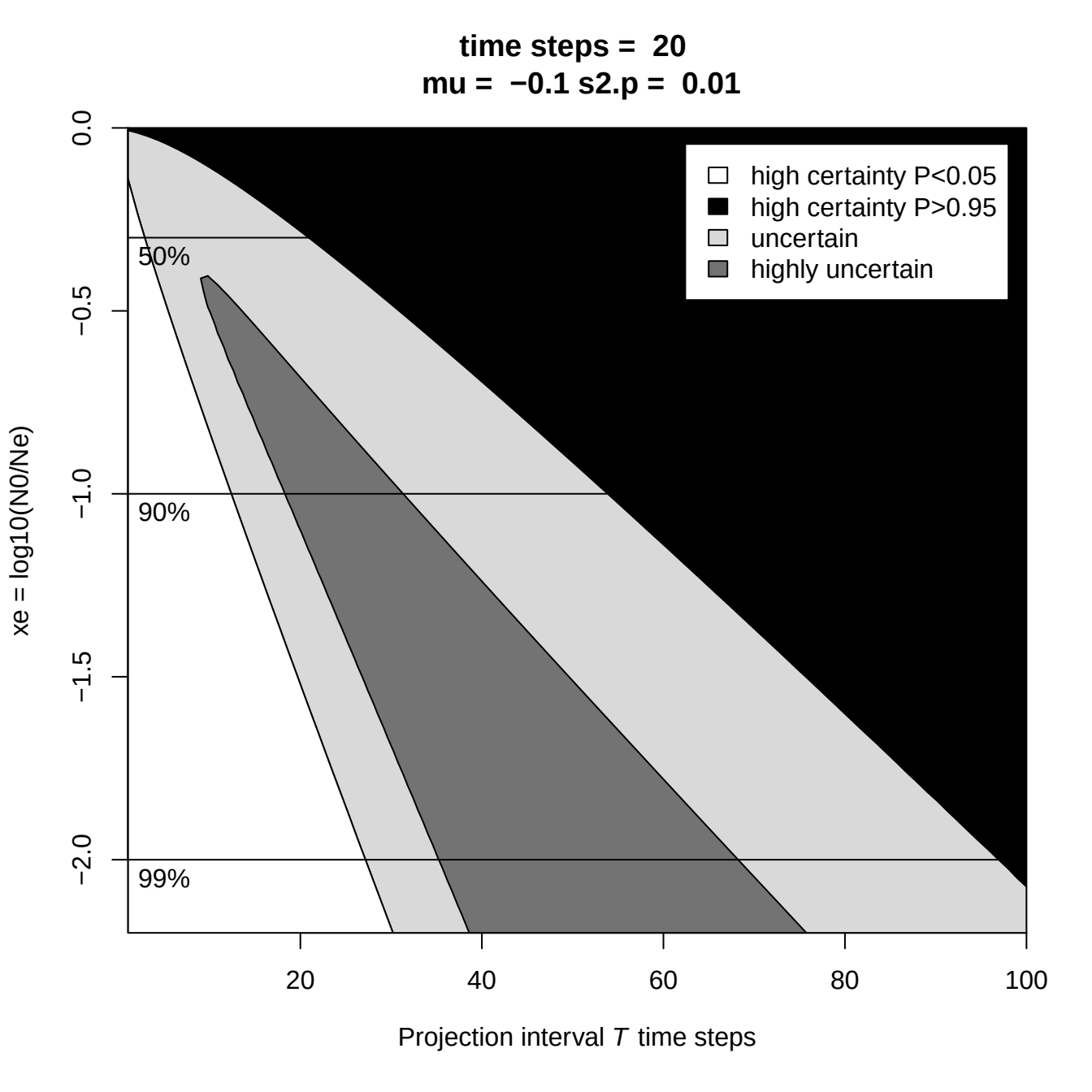

Prob. to hit 1018
95% CI
75% CI
mean
probability to hit threshold
0.0
0.4
0.8
0
20
40
60
80
100
time steps into future

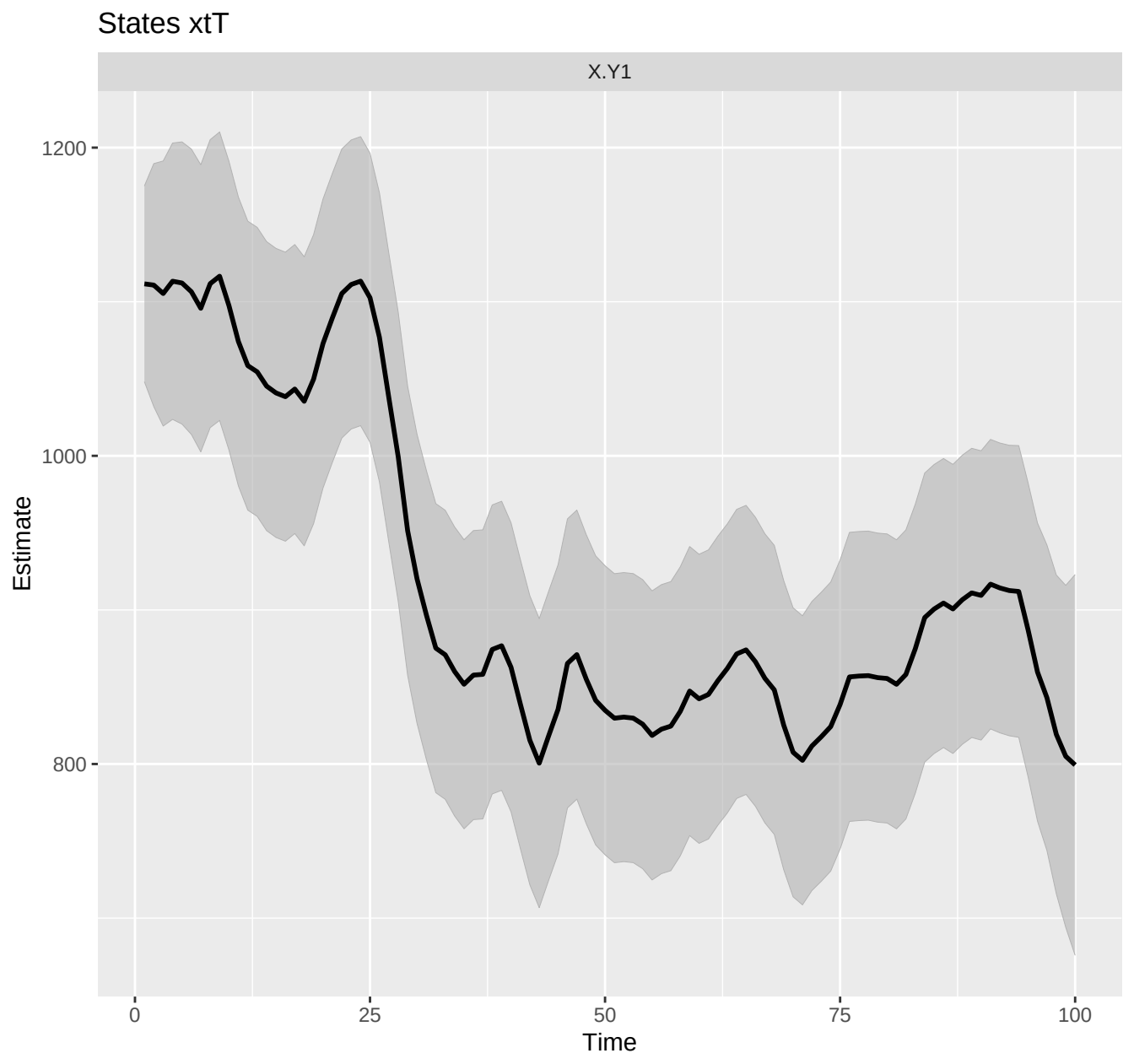

PDF of time to threshold
given it IS reached
probability to hit threshold
0.00
0.02
20
40
60
80
100
time steps into future


Prob. of hitting threshold in 100 time steps
probability to hit threshold
0.0
0.4
0.8
90% threshold
500
1000
1500
2000
Number of ind. at Ne

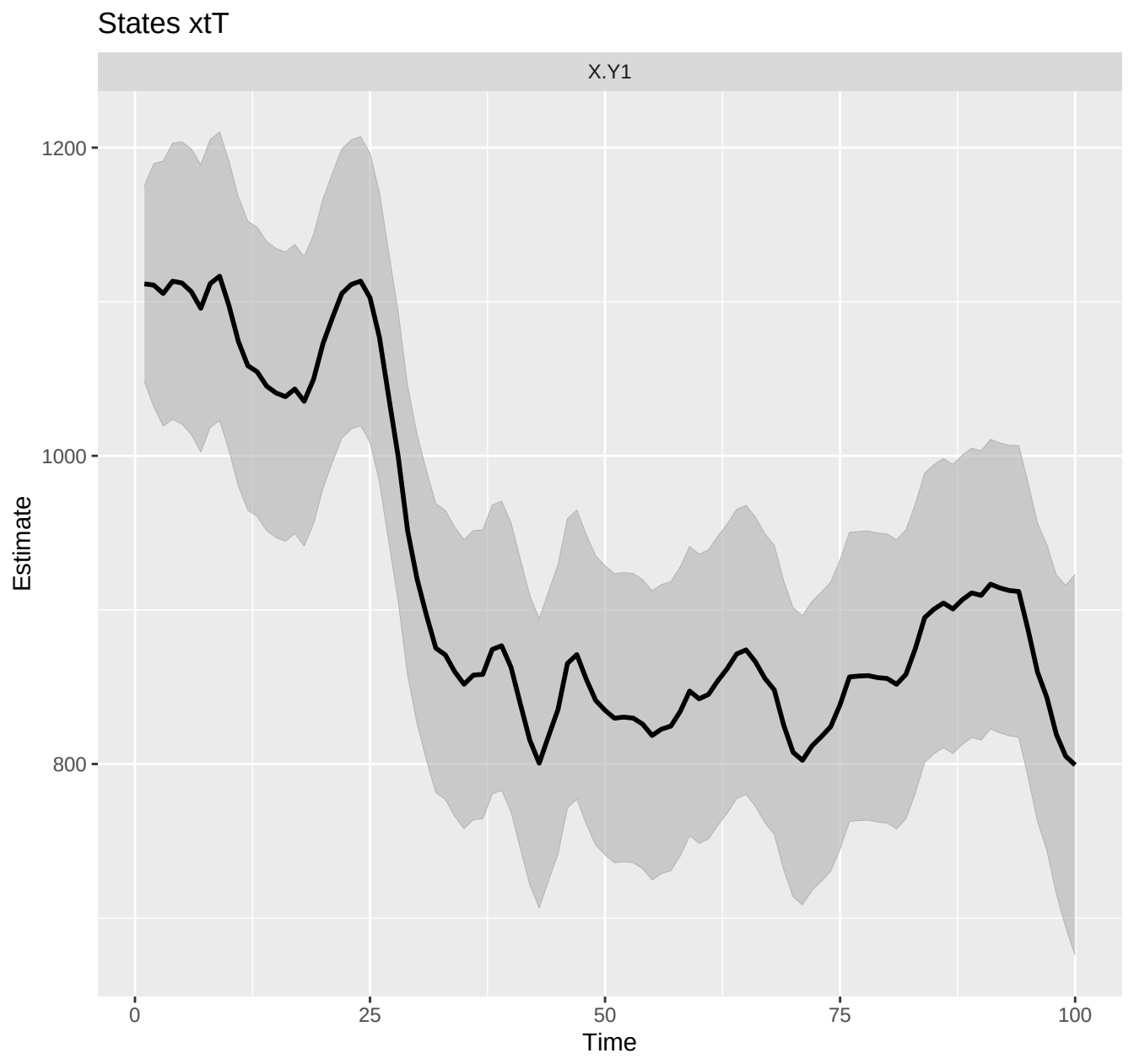

Sample projections
N
0e+00
2e+07
4e+07
0
20
40
60
80
100
time steps into the future


time steps = 30
mu = 0.061 s2.p = 0.014
xe = log10(N0/Ne)
0.0
−1.0
−2.0
50%
90%
99%
20
40
60
80
100
Projection interval T time steps


time steps = 20
mu = −0.1 s2.p = 0.01
high certainty P<0.05
high certainty P>0.95
uncertain
highly uncertain
50%
90%
99%
0.0
−0.5
−1.0
−1.5
−2.0
xe = log10(N0/Ne)
20
40
60
80
100
Projection interval T time steps



This is the estimate of X conditioned on the data from t=1 to T.
Confidence intervals are for the expected value of X (conditioned on the data up to T).



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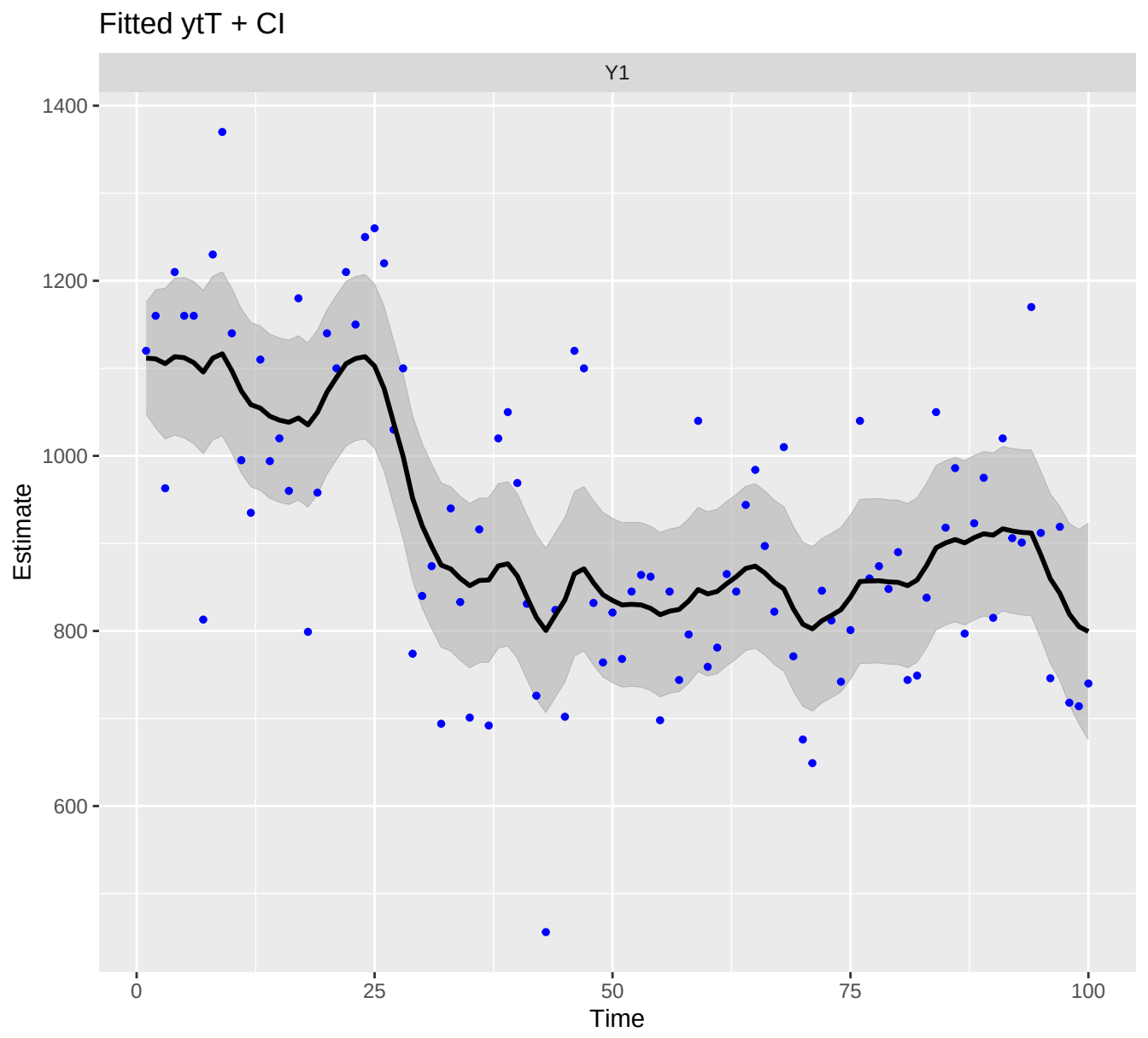
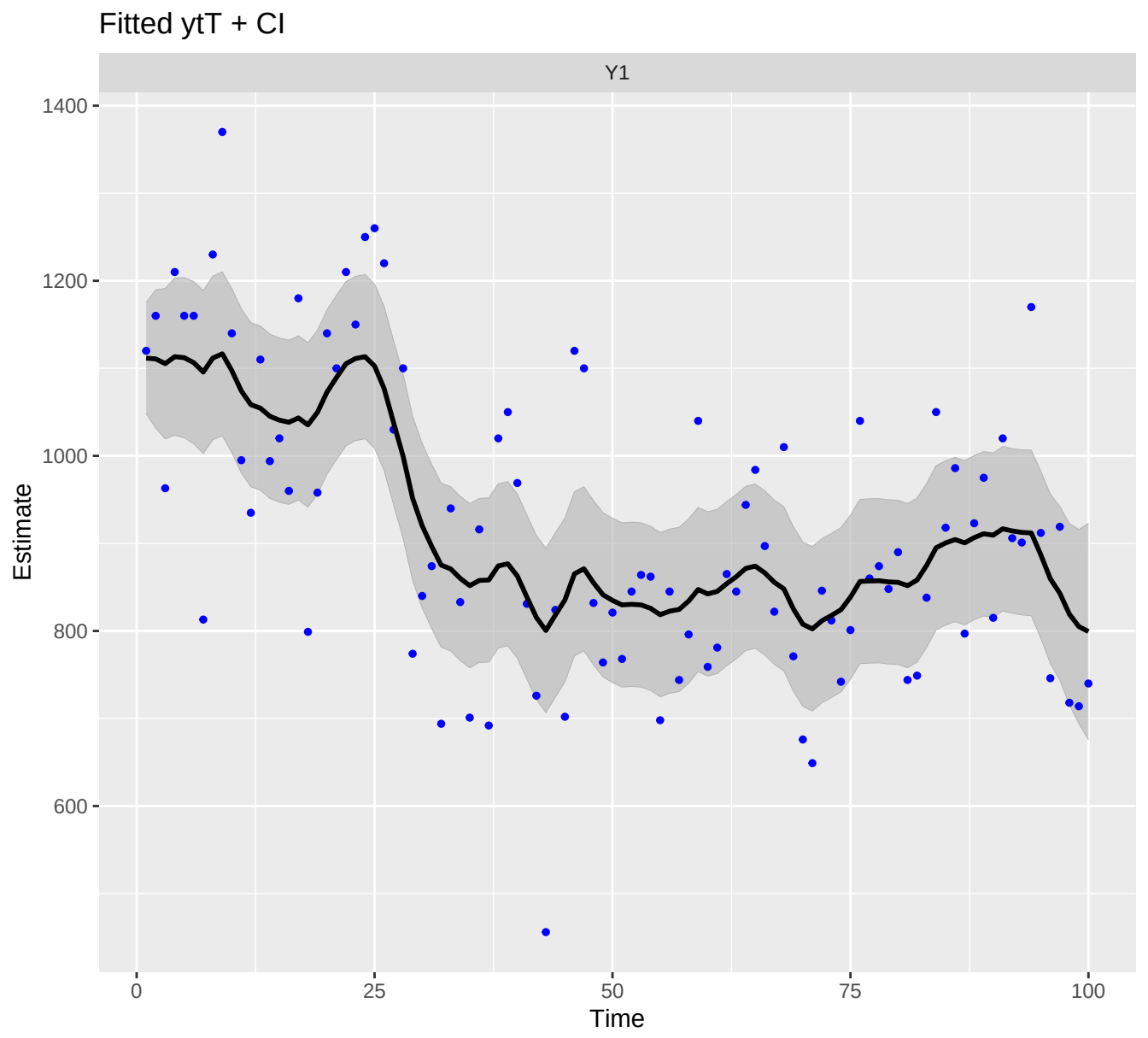
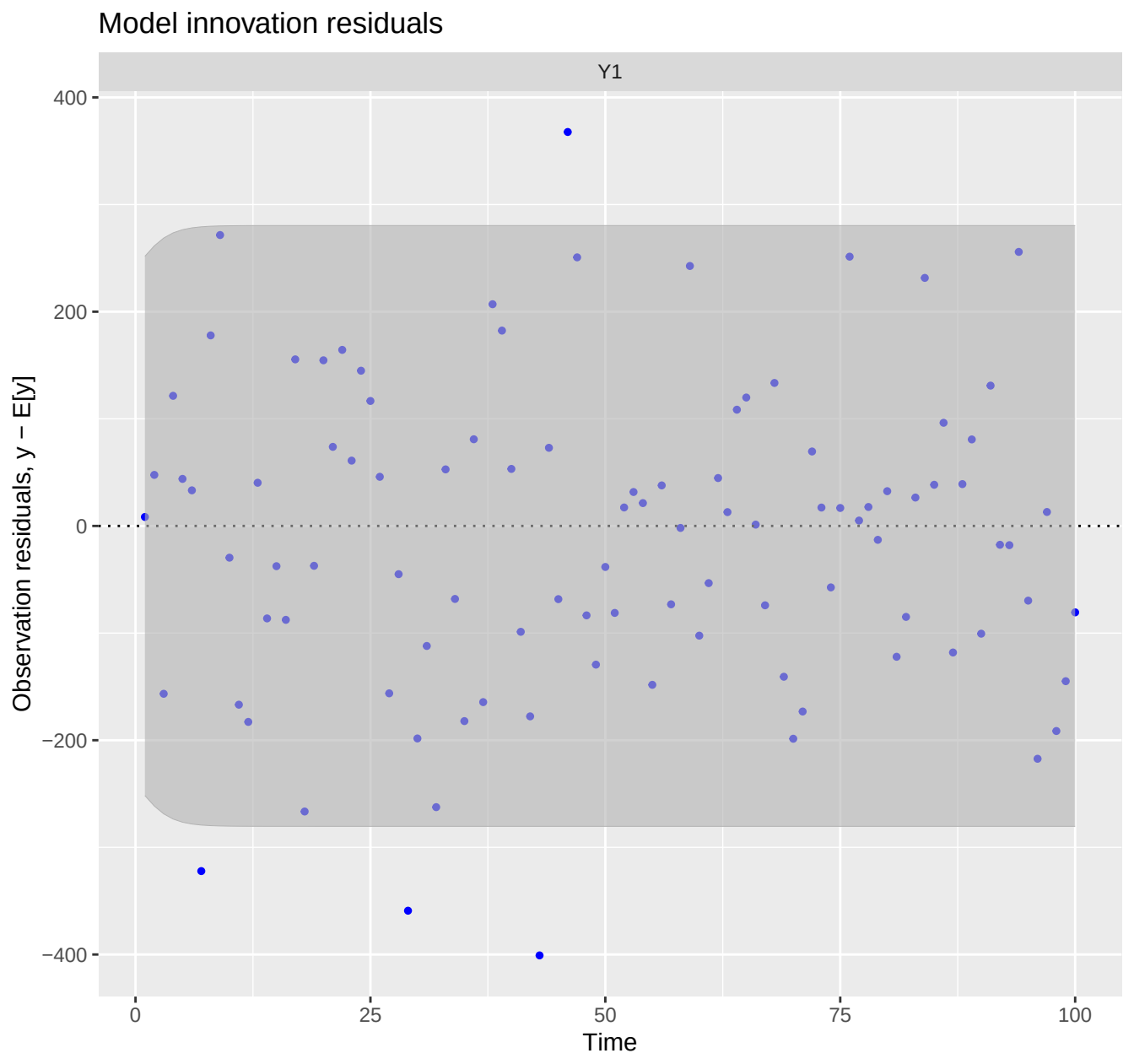
Confidence intervals are for the expected value of X (conditioned on the data up to T).



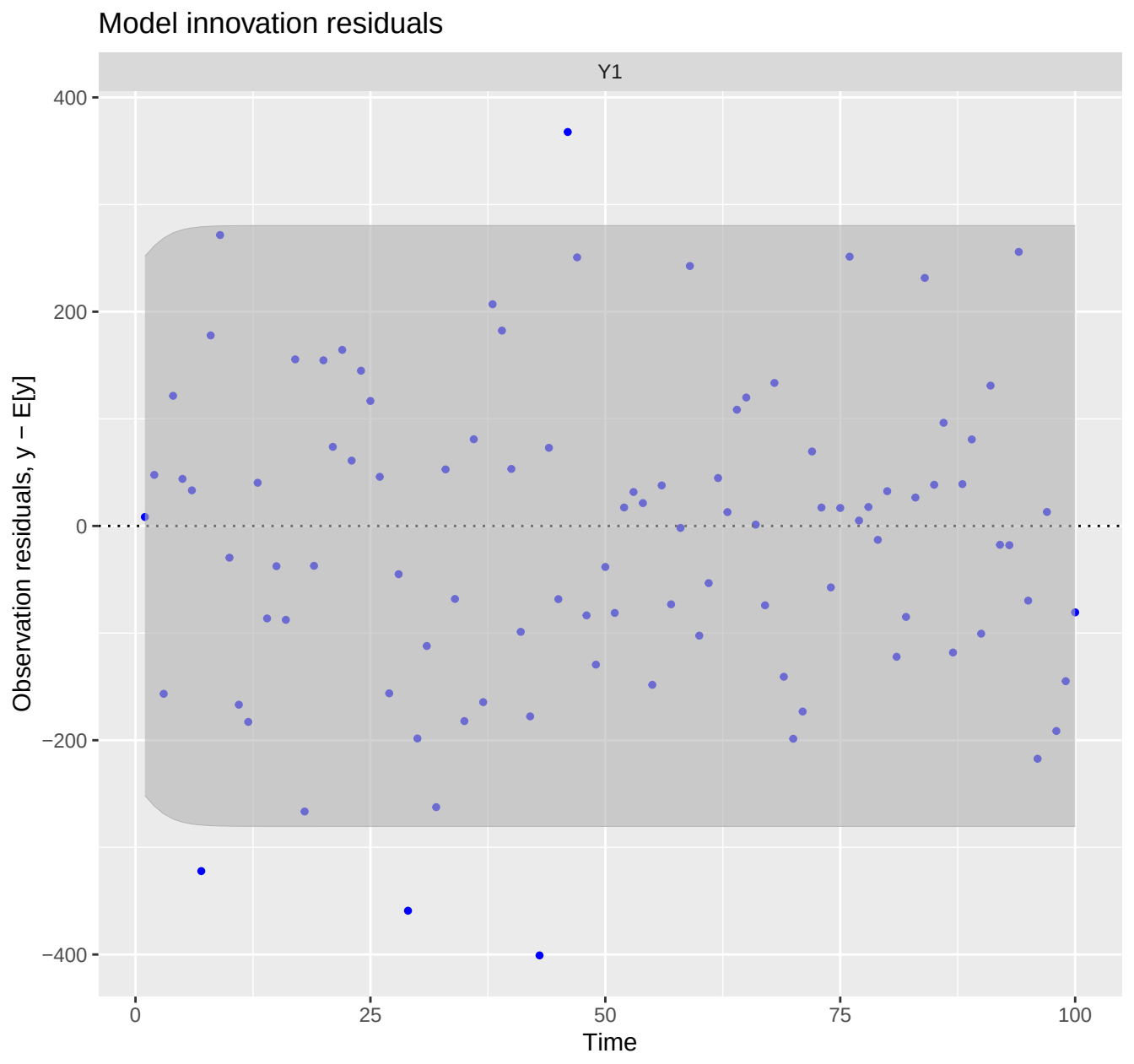
This is the model fitted value of Y conditioned on the data from t=1 to T. Use fitted.ytt1 if you want the one−step−ahead predictions instead. The CI is for the expected value of Y and the data points will not fall within the CI. Use prediction intervals to compare the data to intervals.



This is the model fitted value of Y conditioned on the data from t=1 to T. Use fitted.ytt1 if you want the one−step−ahead predictions instead. The CI is for the expected value of Y and the data points will not fall within the CI. Use prediction intervals to compare the data to intervals.



Innovations (one−step ahead) residuals.These residuals should not have a temporal trend and 95% of residuals should fall within the CIs. A violation of this indicates that the model cannot fit the data.



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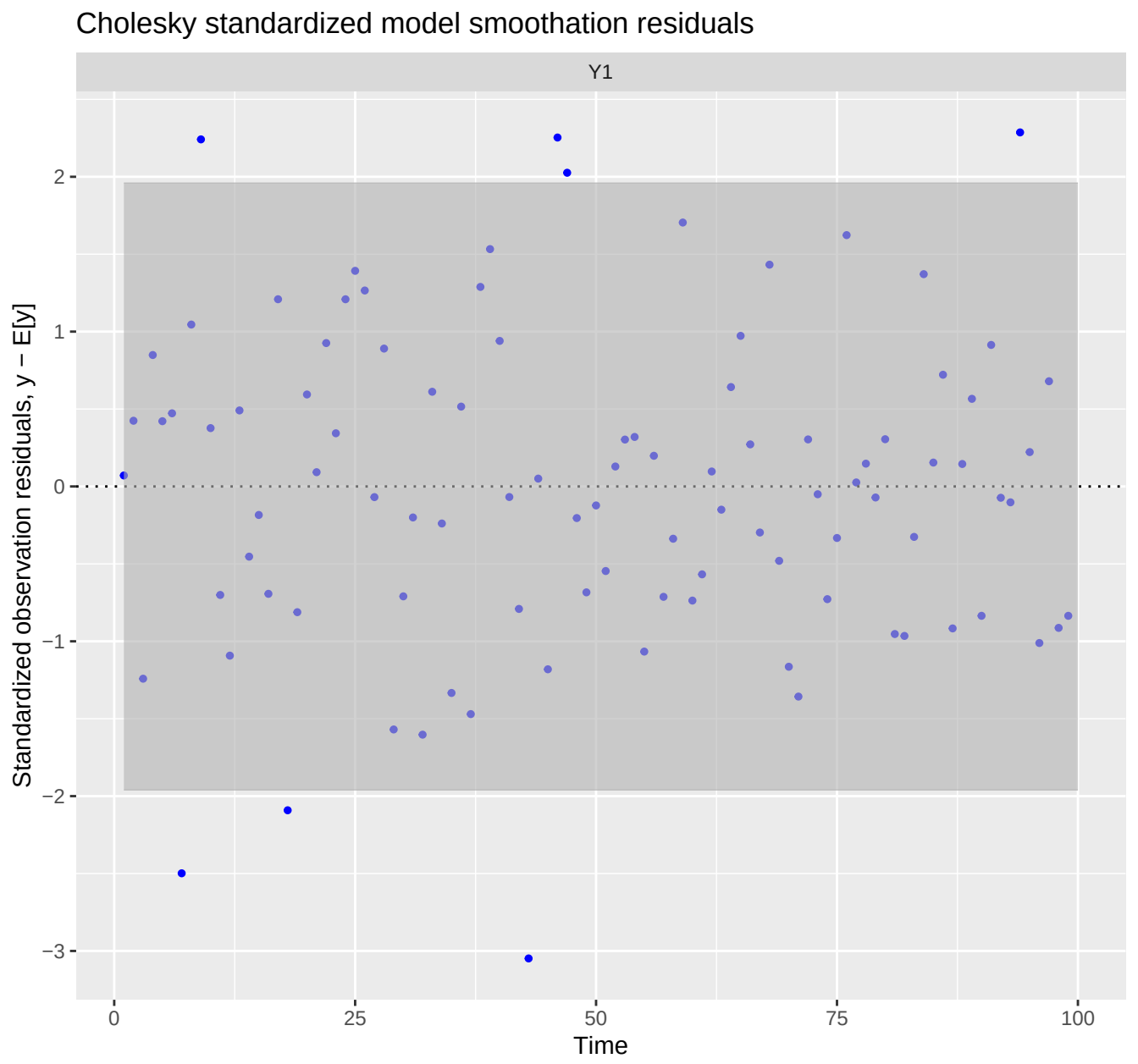
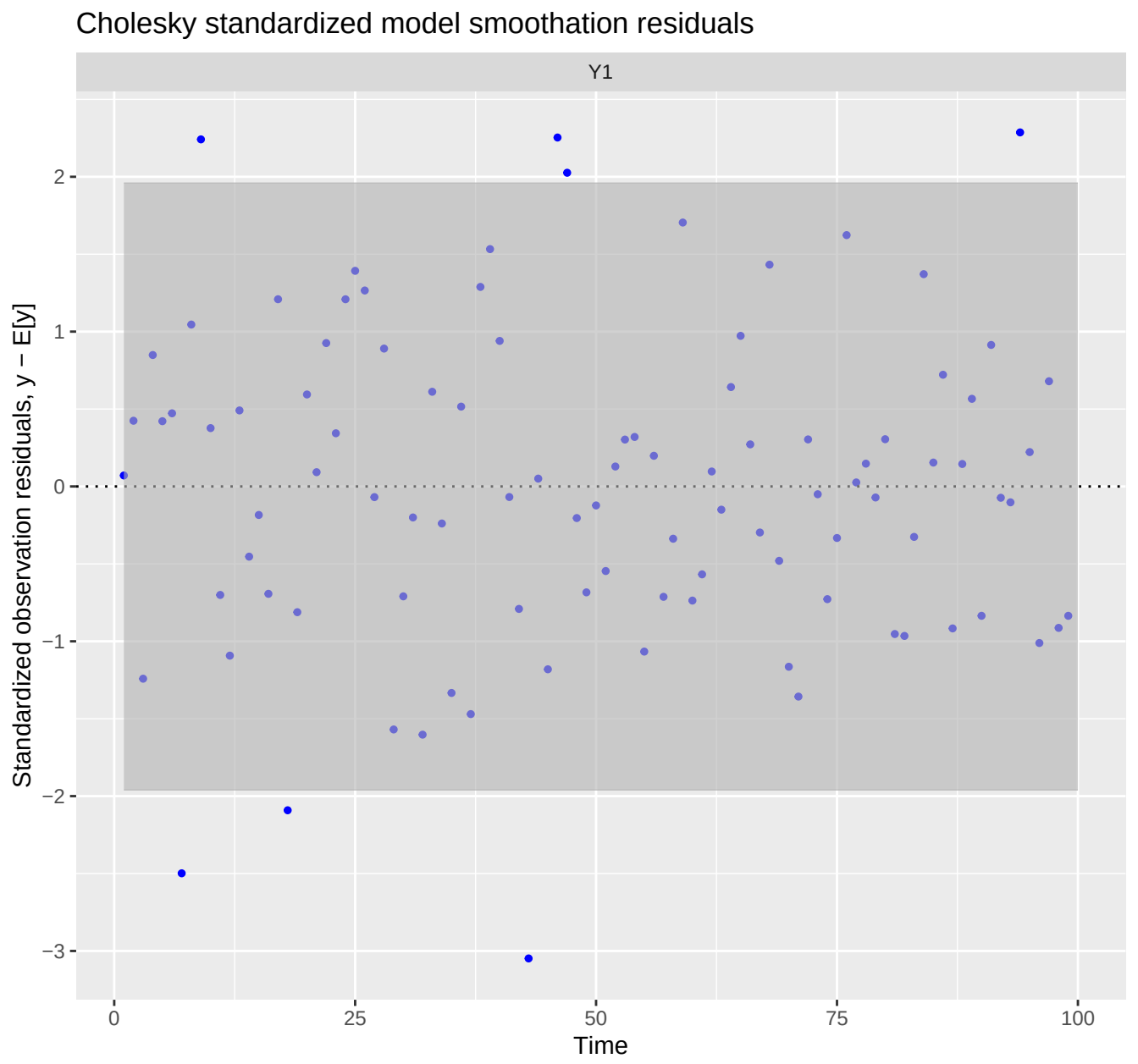
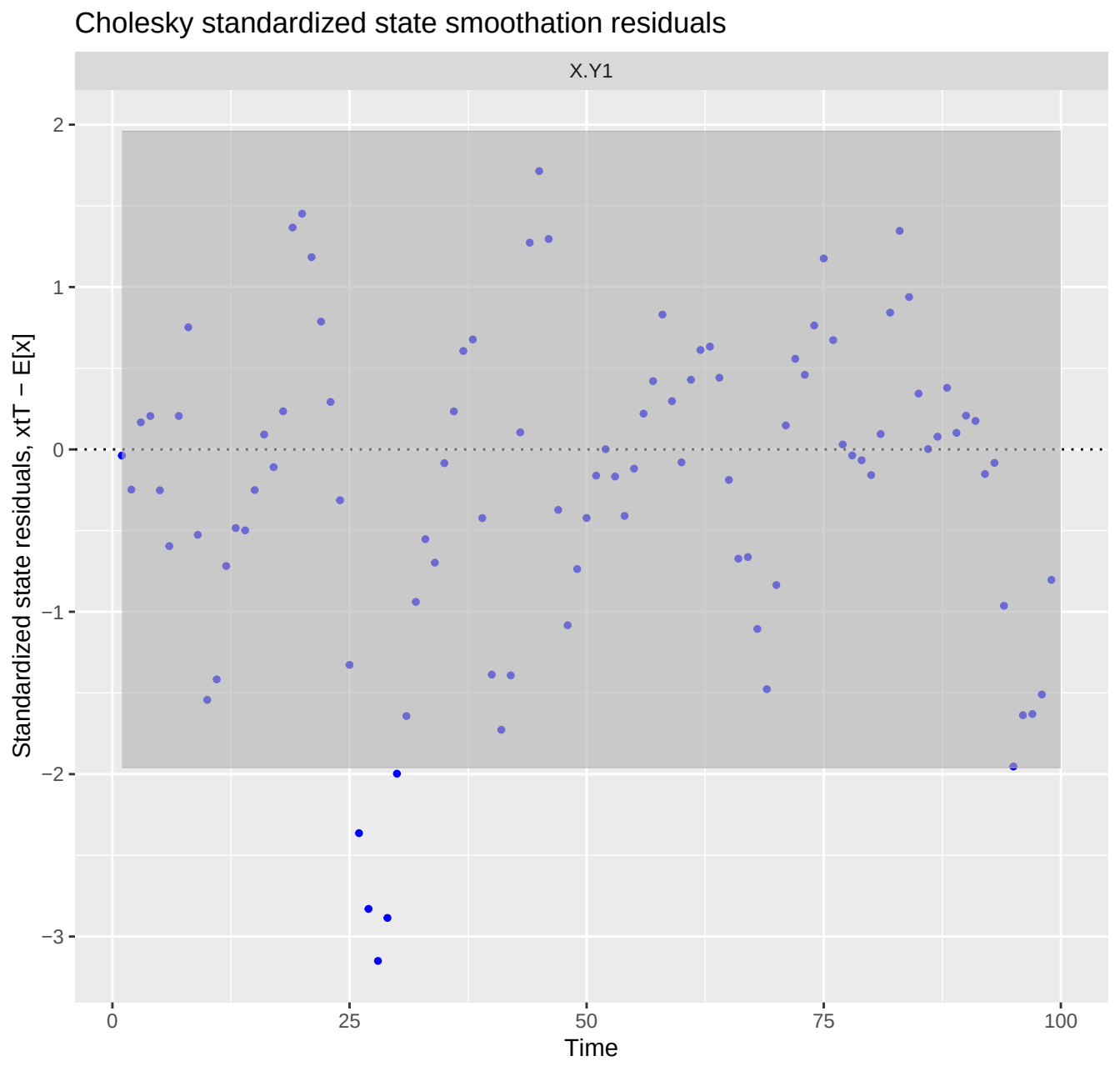


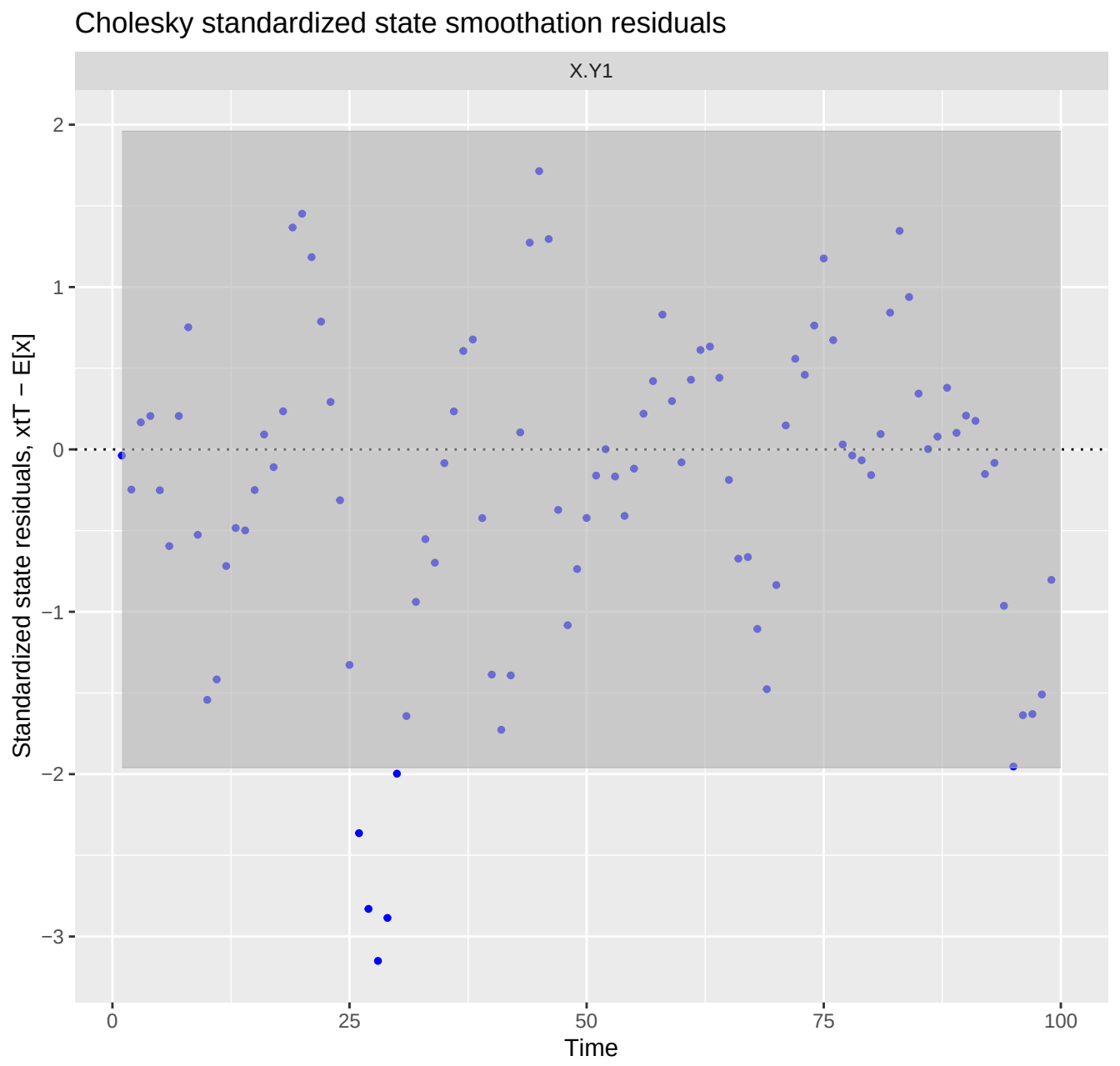
Cholesky standardized model smoothation (ytT) residuals. These residuals should not have a temporal trend. Residuals outside the +/− 2 limits are potential outliers.



Cholesky standardized model smoothation (ytT) residuals. These residuals should not have a temporal trend. Residuals outside the +/− 2 limits are potential outliers.



Cholesky standardized state smoothation (xtT) residuals. Residuals outside the +/− 2 limits are potential outliers of x(t) to x(t+1).



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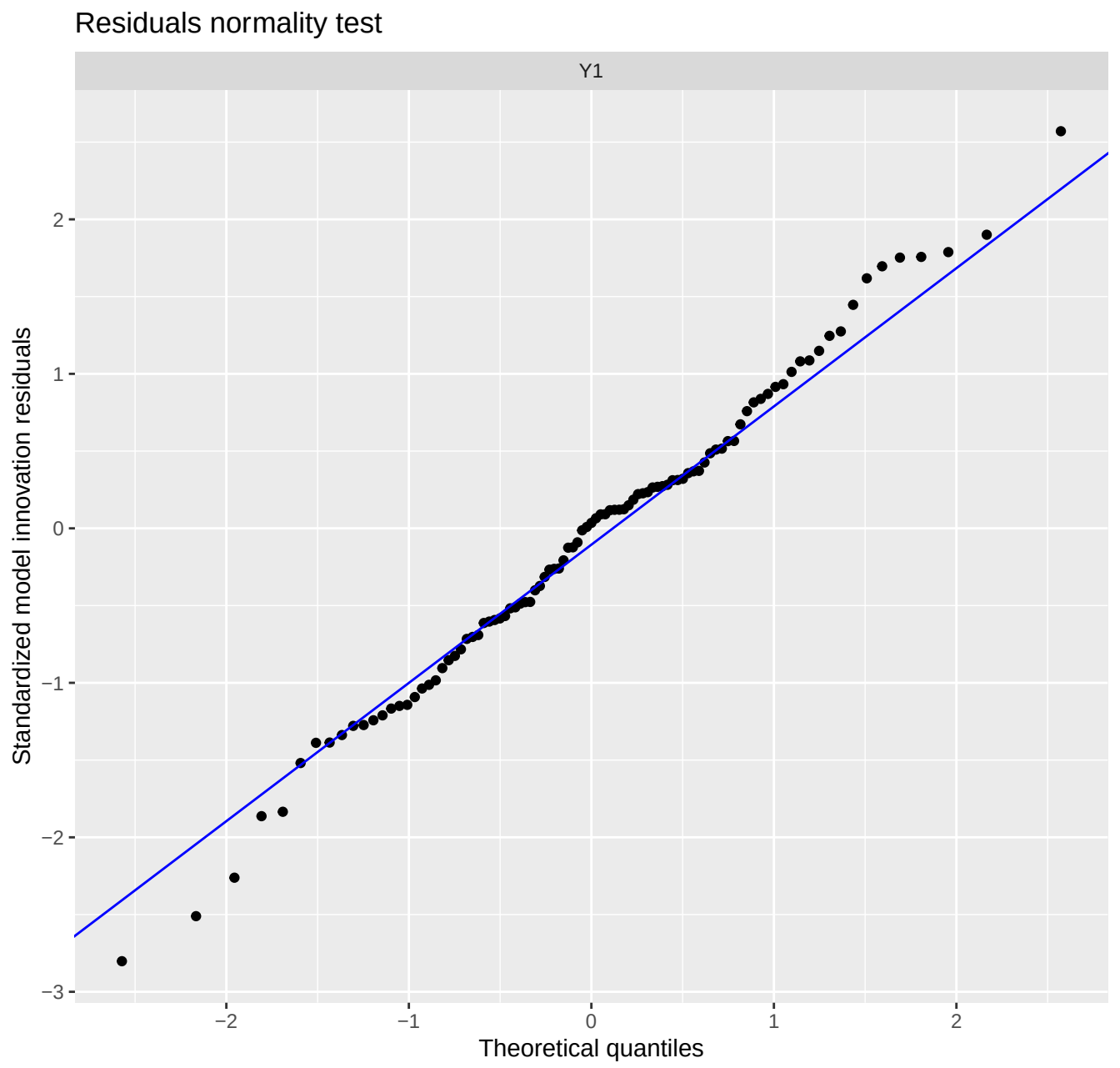
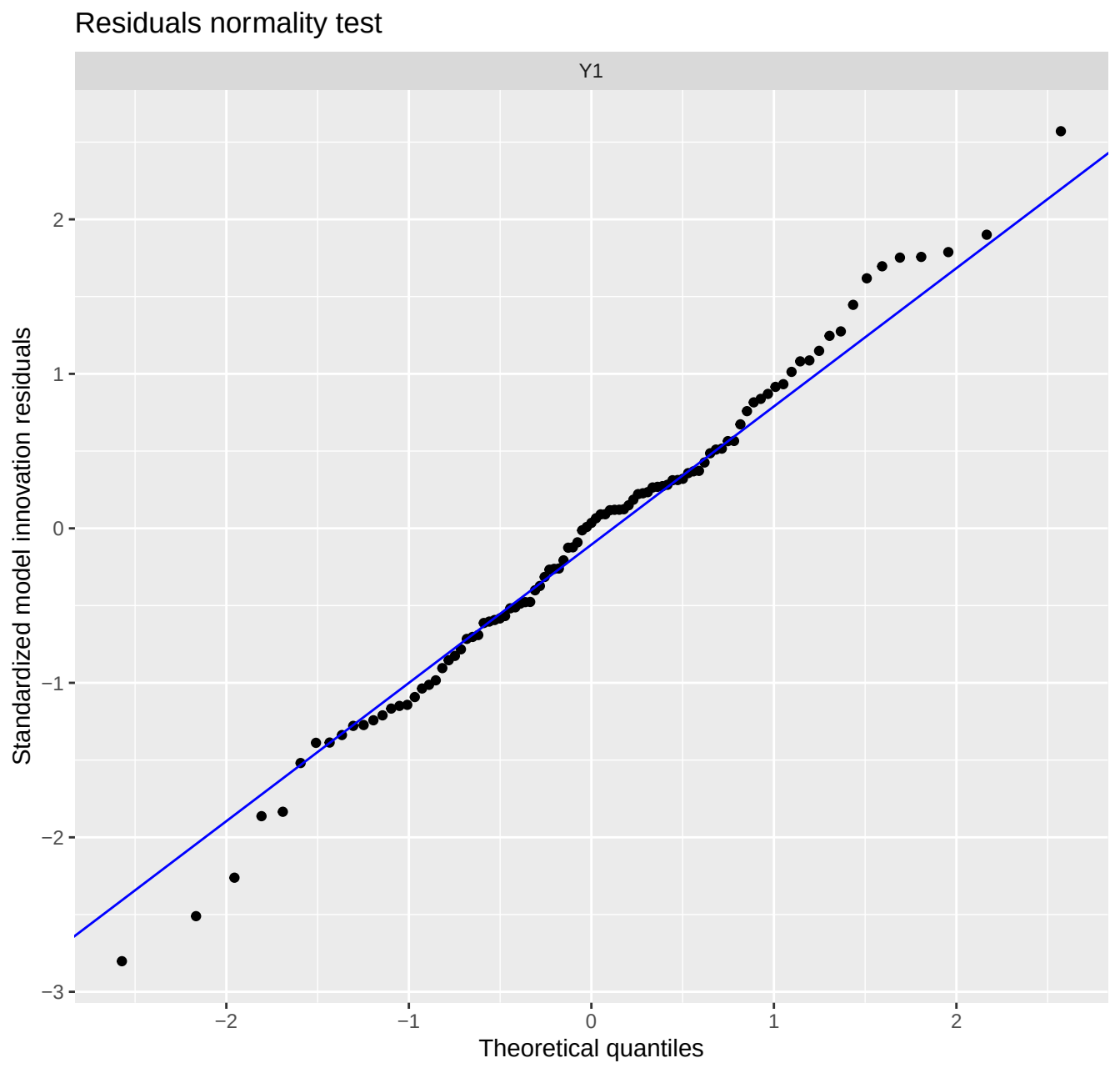
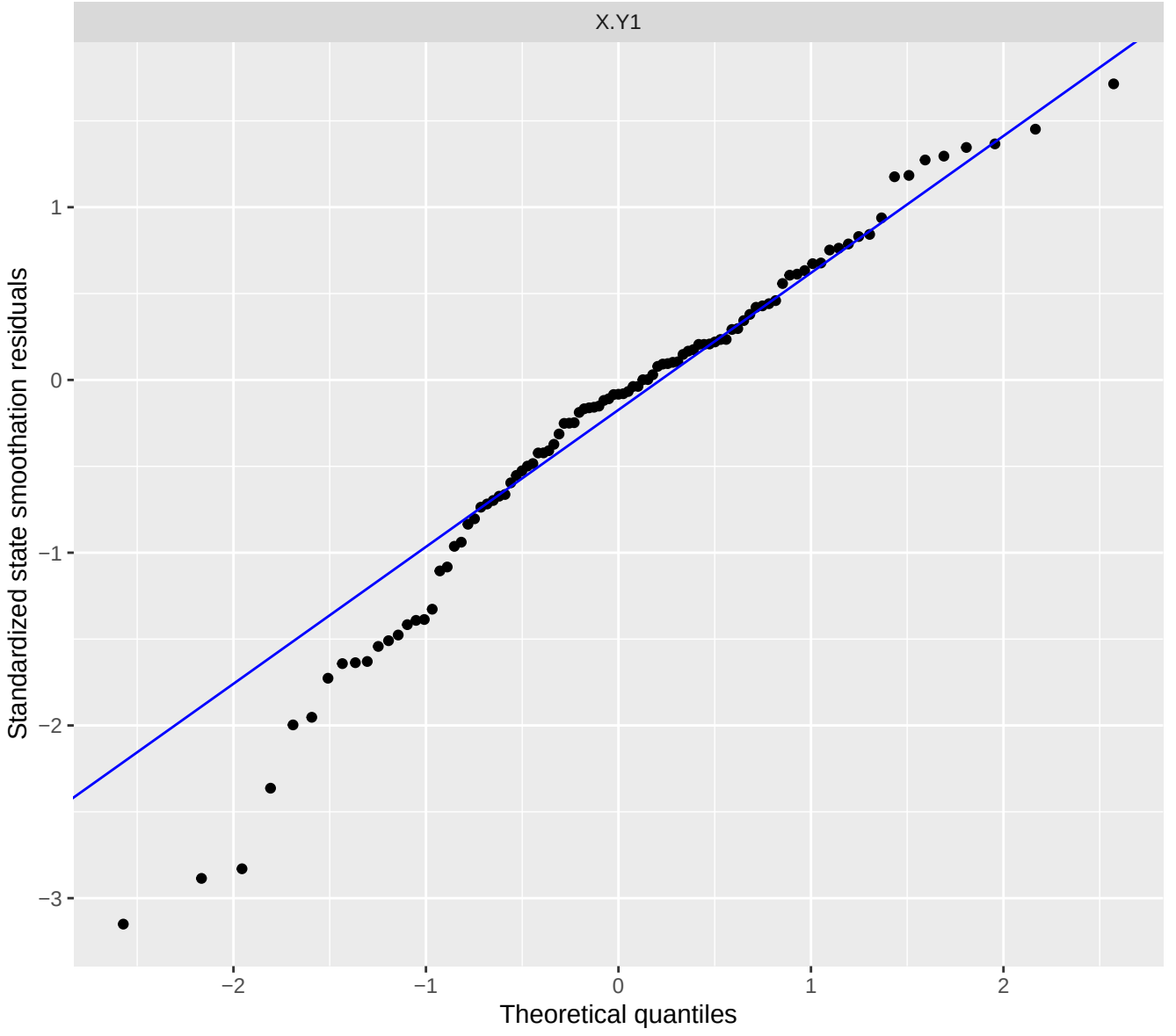


Cholesky standardized model innovation (ytt1) residuals. The residuals should be Gaussian



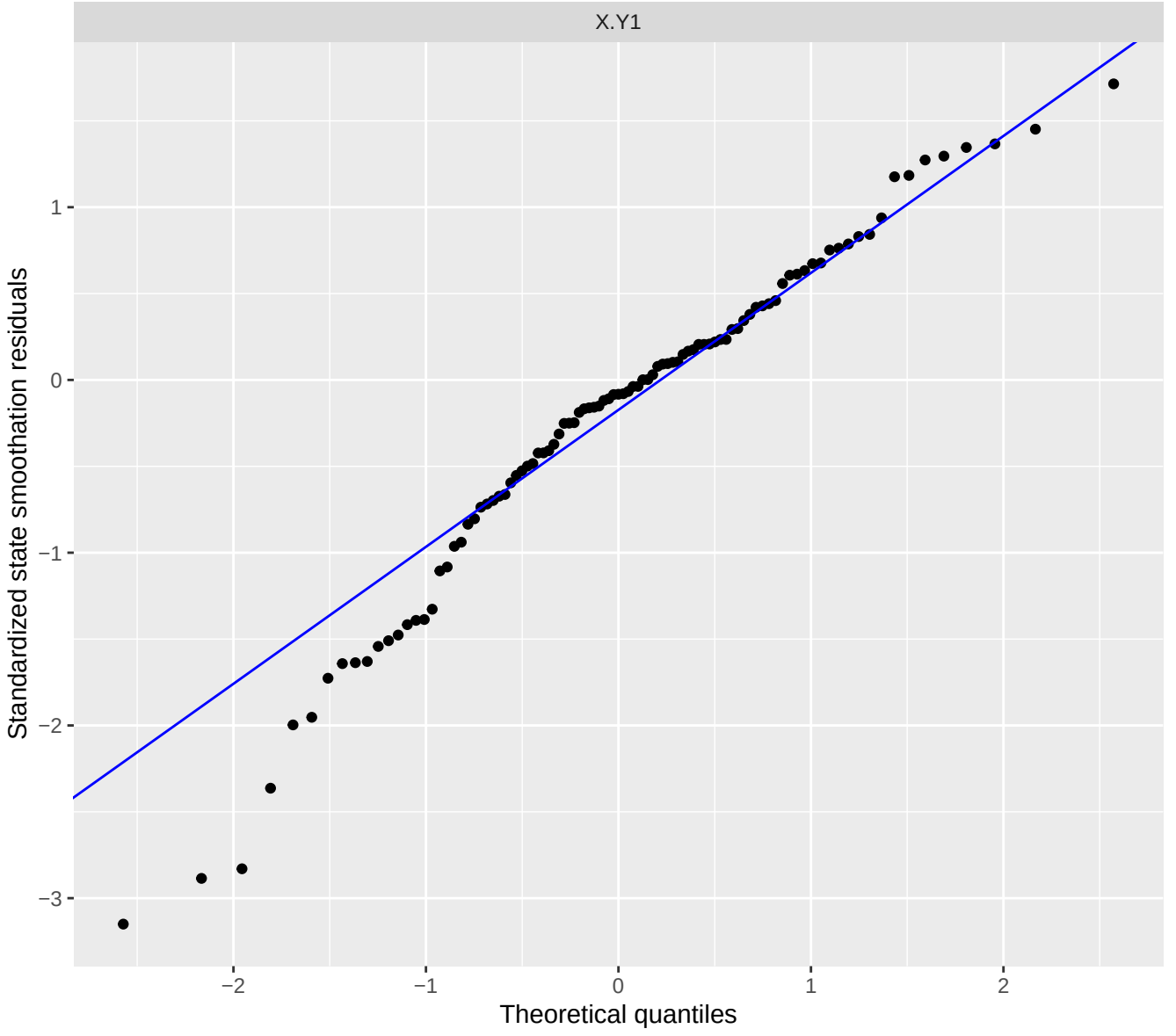
Cholesky standardized model innovation (ytt1) residuals. The residuals should be Gaussian

Residuals normality test

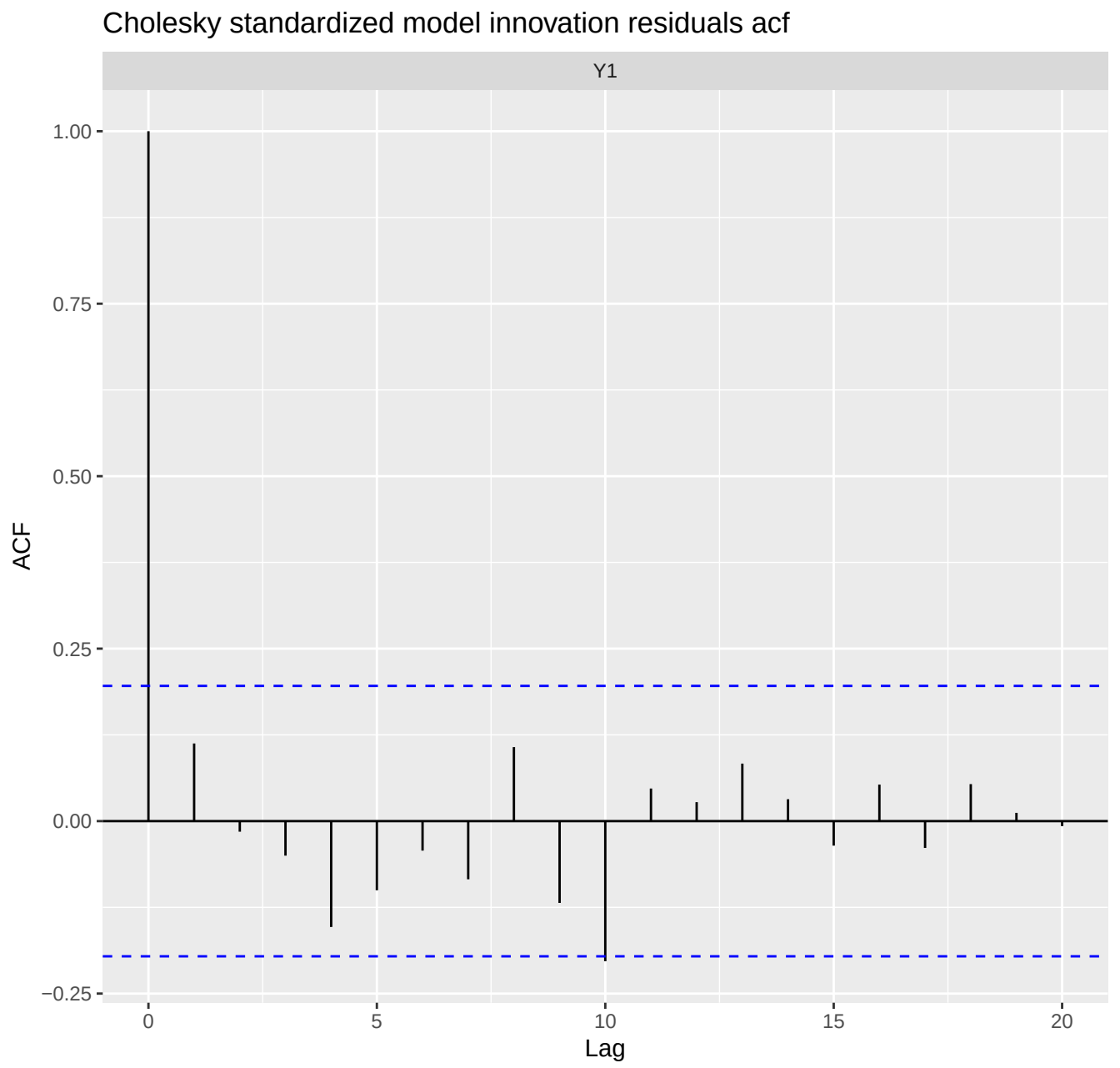


Cholesky standardized state smoothation (xtT) residuals. The residuals should be Gaussian. Note if the data have many missing values, the state residuals will not be Gaussian. In that case, manually remove the states residuals associated with missing data and redo the qq plot.

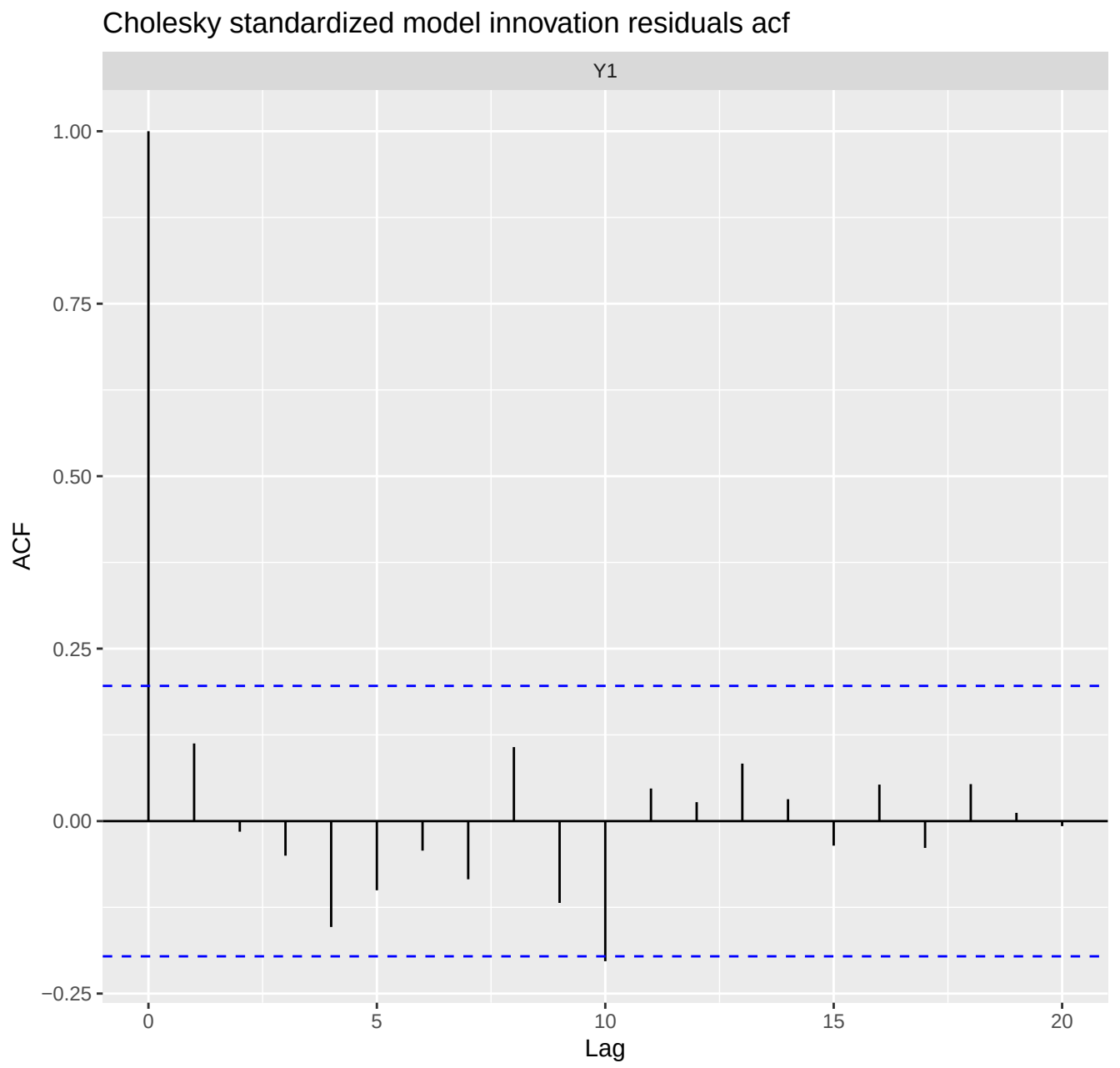
Residuals normality test



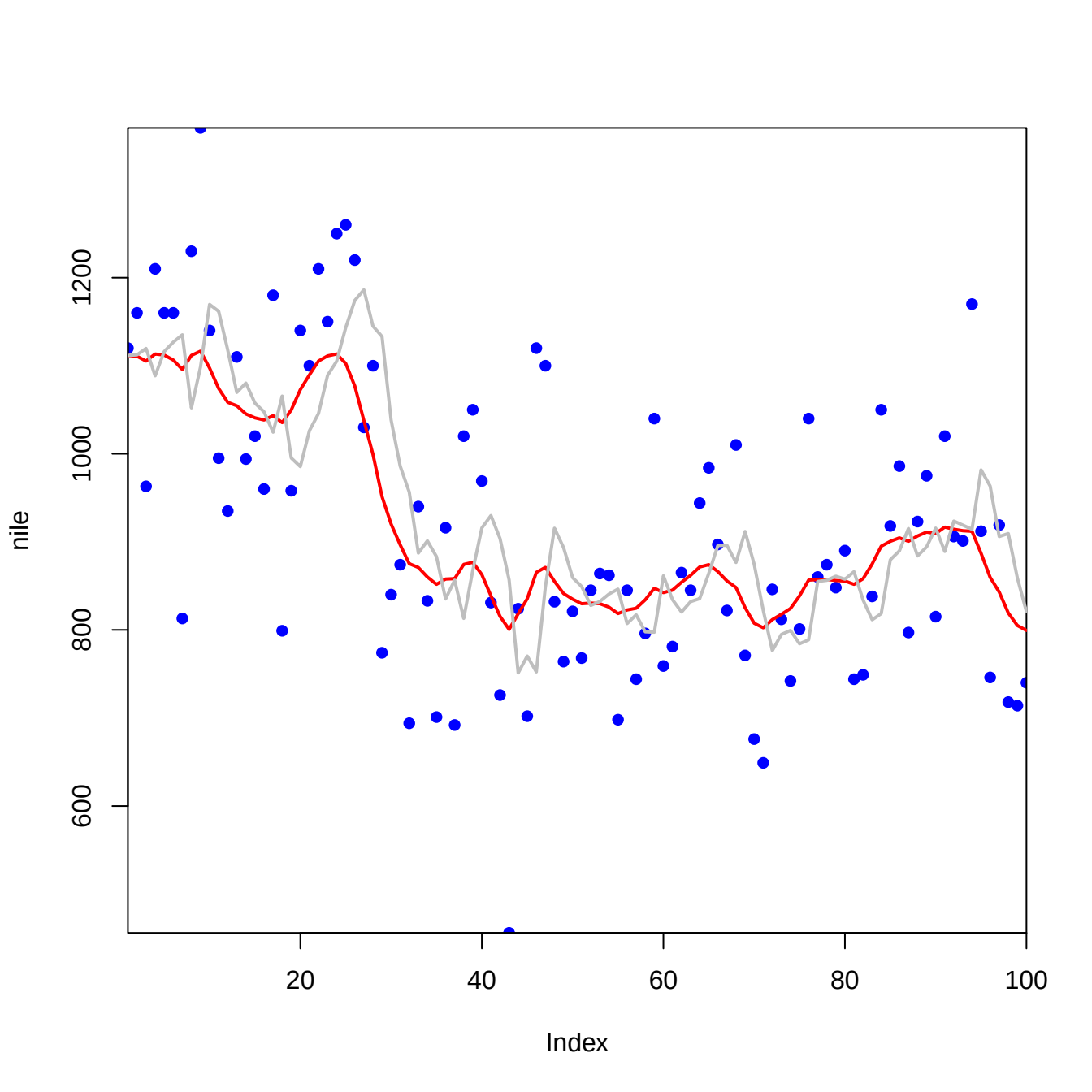
Cholesky standardized state smoothation (xtT) residuals. The residuals should be Gaussian. Note if the data have many missing values, the state residuals will not be Gaussian. In that case, manually remove the states residuals associated with missing data and redo the qq plot.

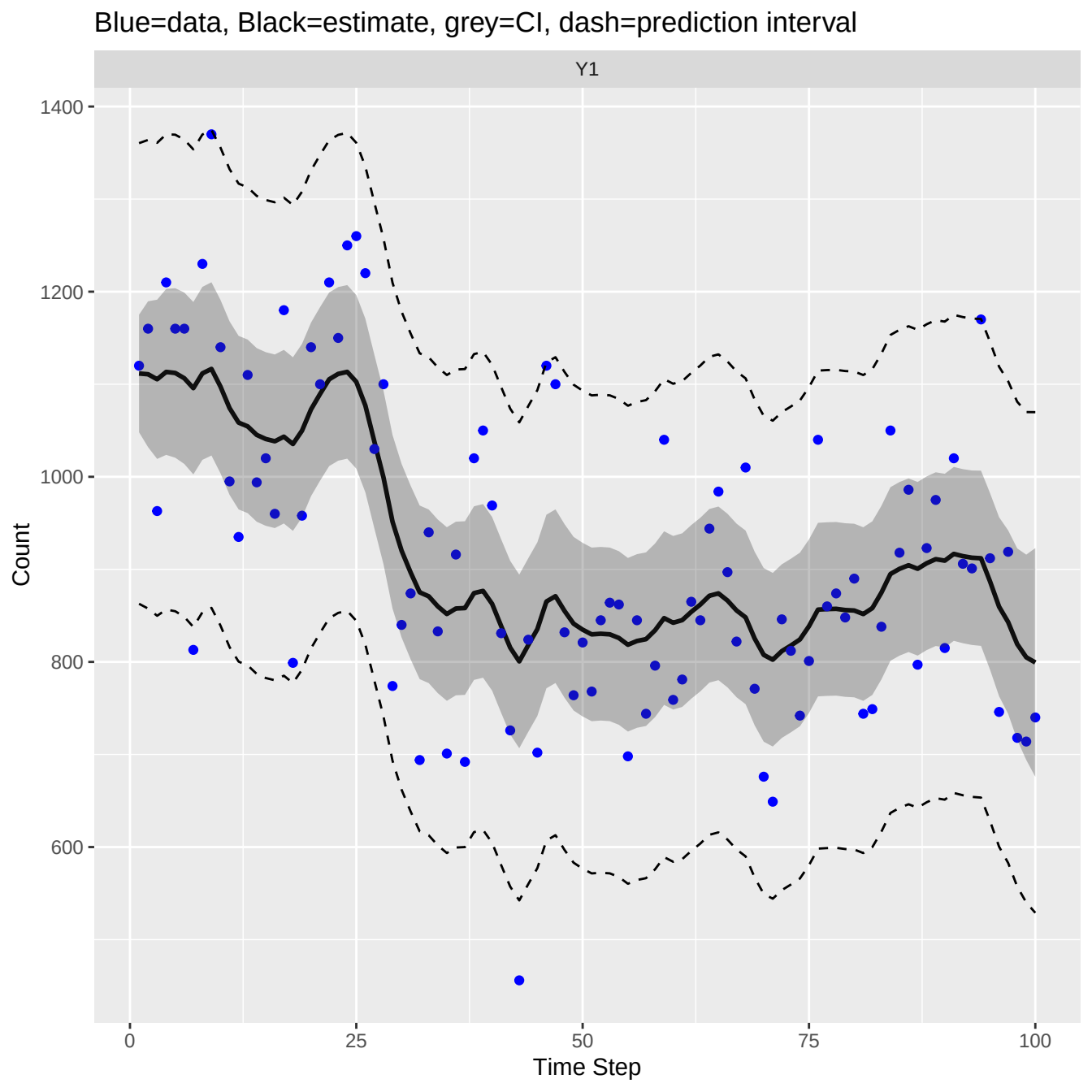


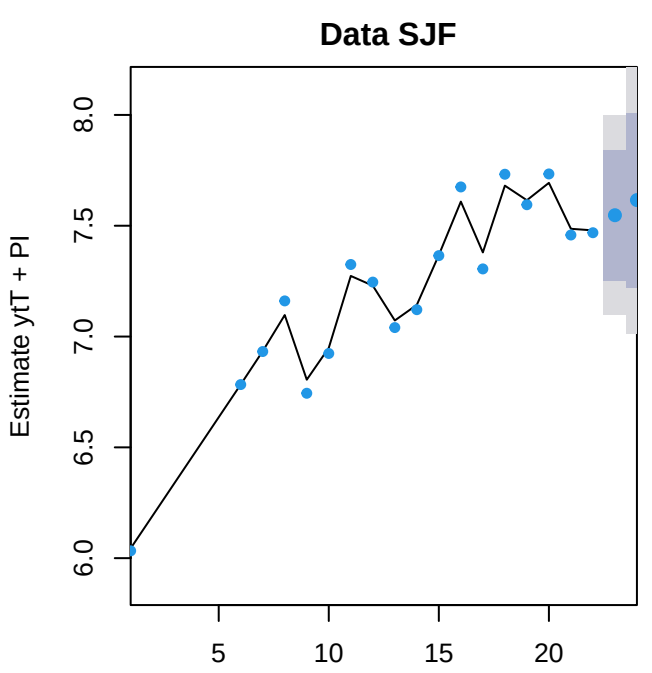
Cholesky standardized model innovation (ytt1) residuals. These residuals should be temporally uncorrelated.

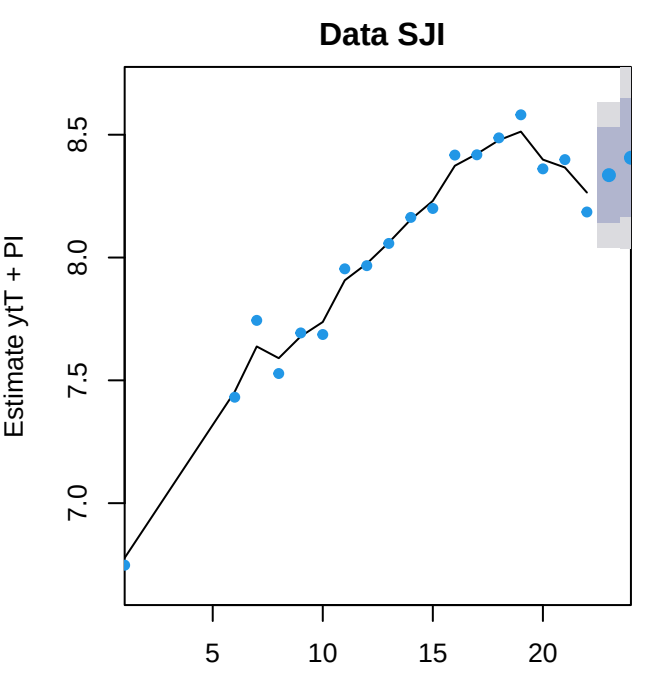


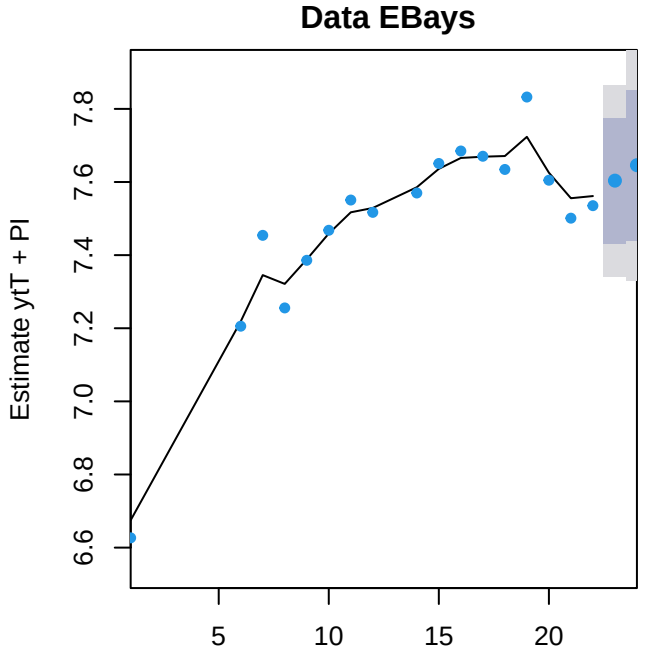
Cholesky standardized model innovation (ytt1) residuals. These residuals should be temporally uncorrelated.

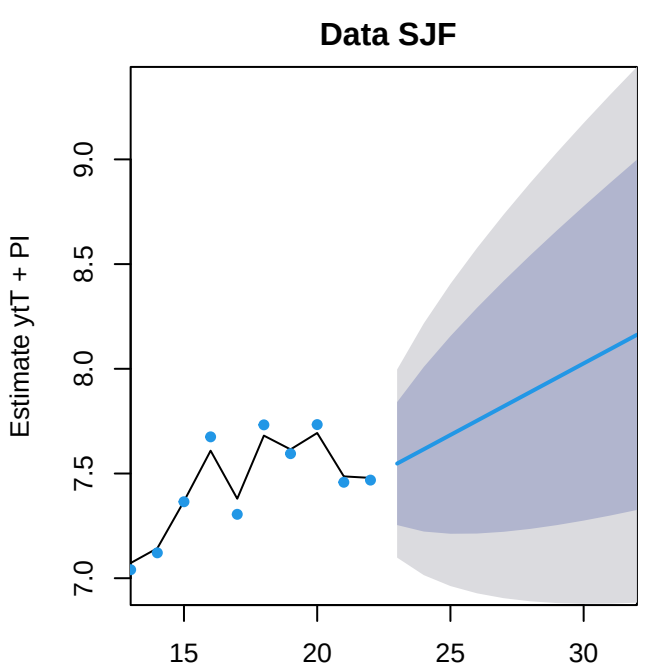

nile
1200
1000
800
600
20
40
60
80
100
Index

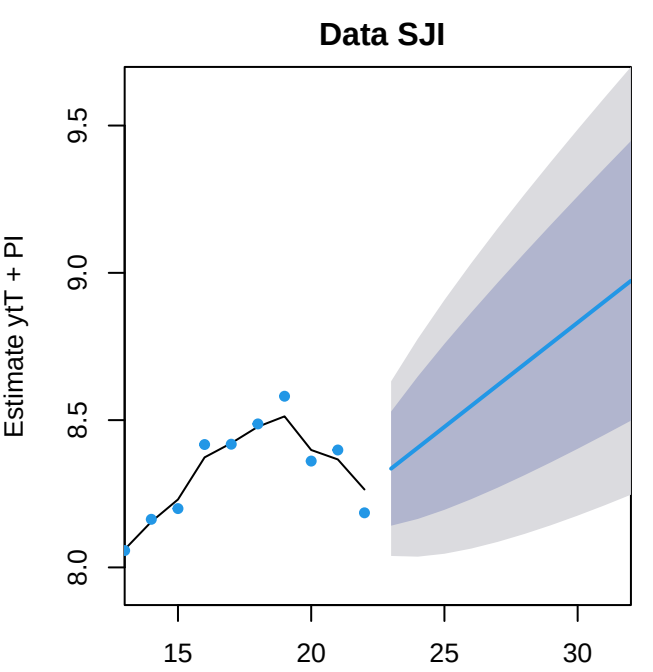

Blue=data, Black=estimate, grey=CI, dash=prediction interval
Y1
1400
1200
1000
800
600
Count
0
25
50
75
100
Time Step

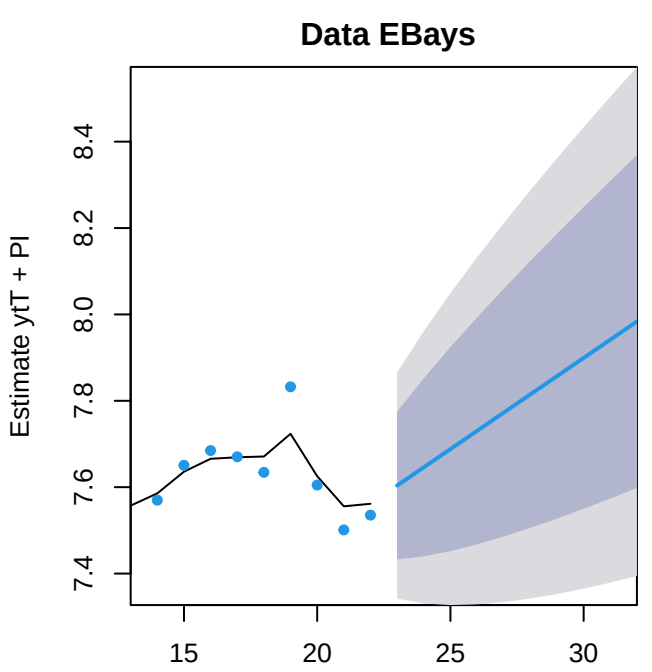

Data SJF
Estimate ytT + PI
6.0
6.5
7.0
7.5
8.0
5
10
15
20

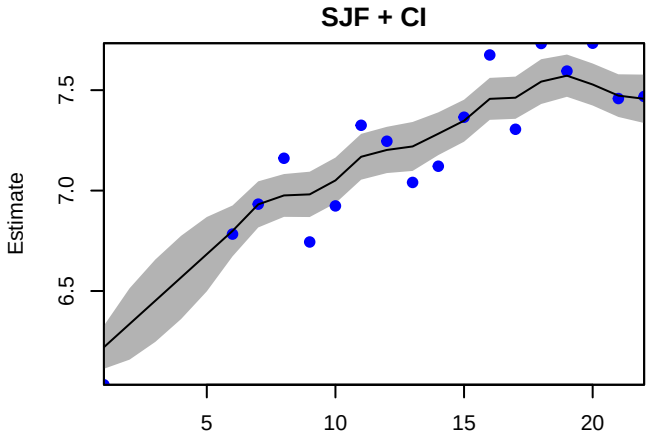

Data SJI
Estimate ytT + PI
7.0
7.5
8.0
8.5
5
10
15
20

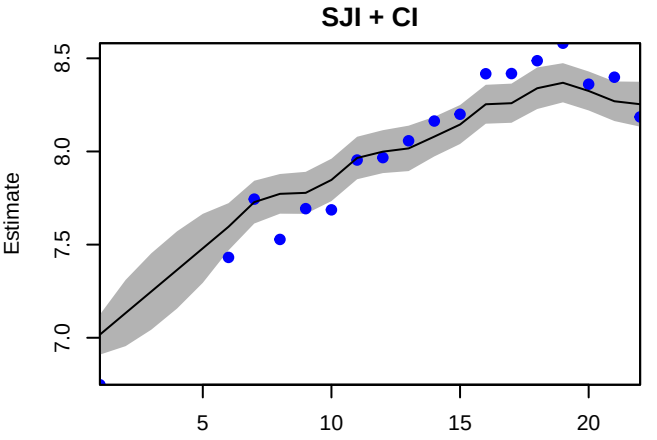

Data EBays
Estimate ytT + PI
6.6
6.8
7.0
7.2
7.4
7.6
7.8
5
10
15
20

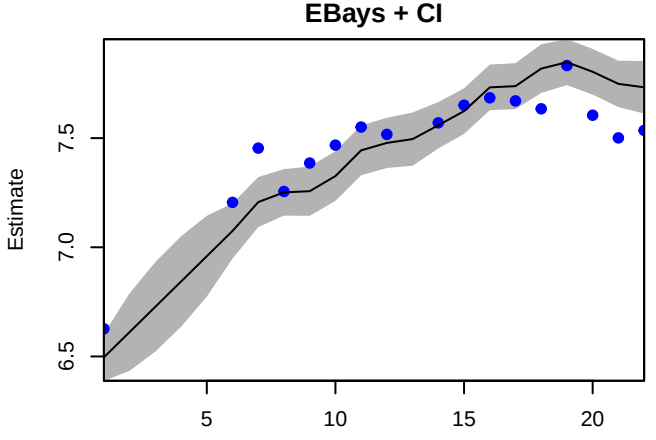

Data SJF
Estimate ytT + PI
7.0
7.5
8.0
8.5
9.0
15
20
25
30

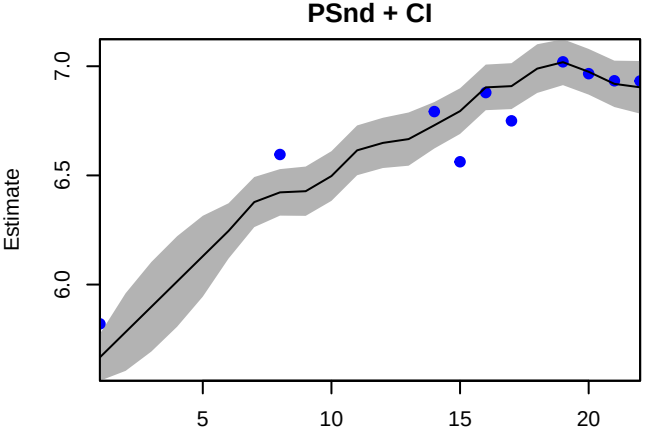

Data SJI
Estimate ytT + PI
8.0
8.5
9.0
9.5
15
20
25
30

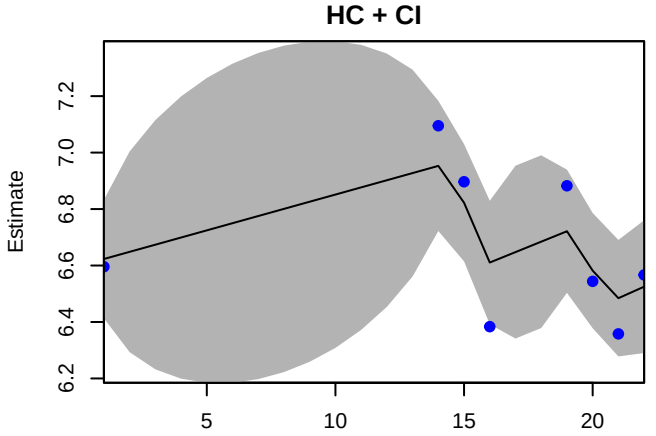

Data EBays
Estimate ytT + PI
7.4
7.6
7.8
8.0
8.2
8.4
15
20
25
30

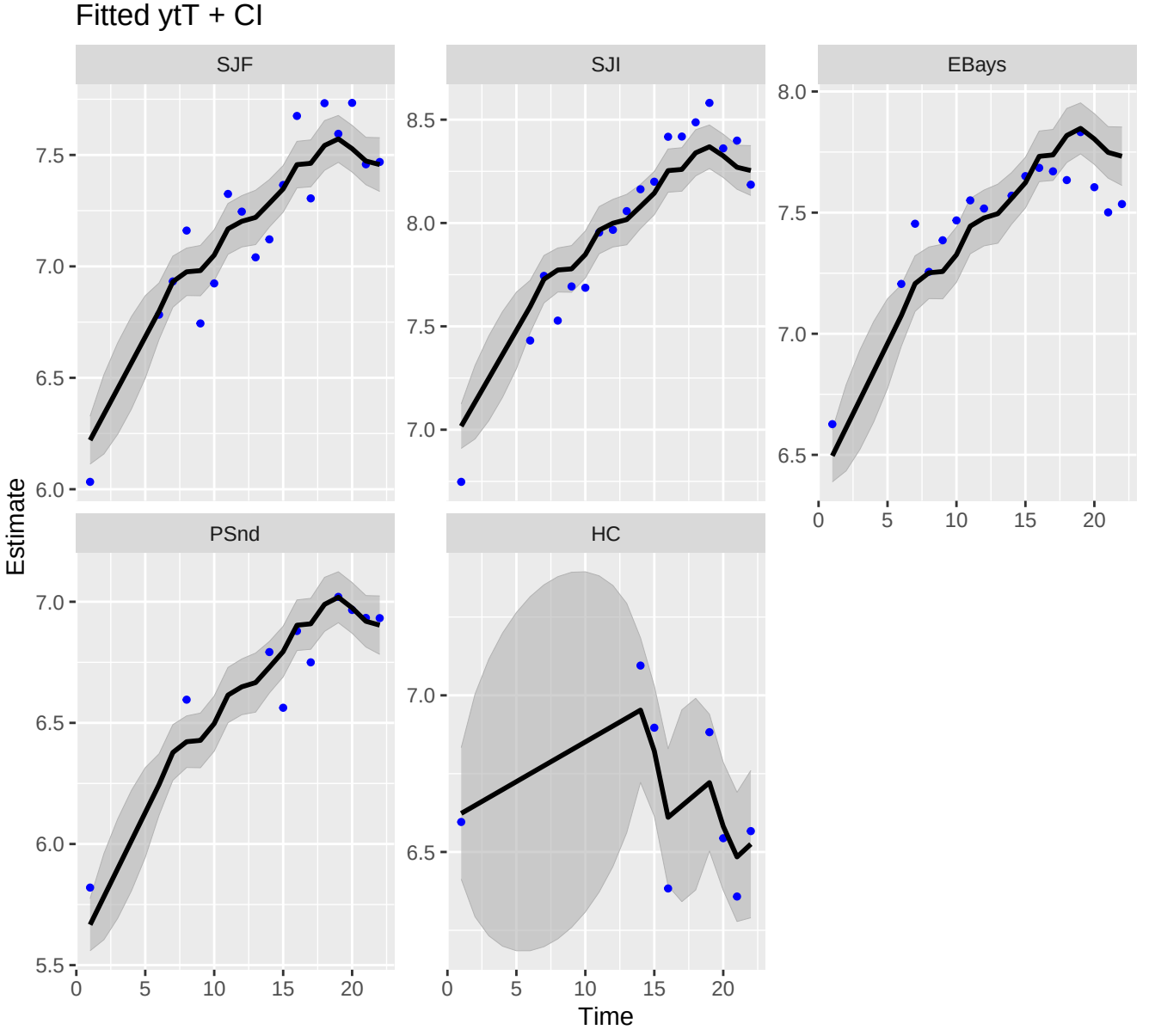

SJF + CI
Estimate
6.5
7.0
7.5
5
10
15
20


SJI + CI
Estimate
7.0
7.5
8.0
8.5
5
10
15
20

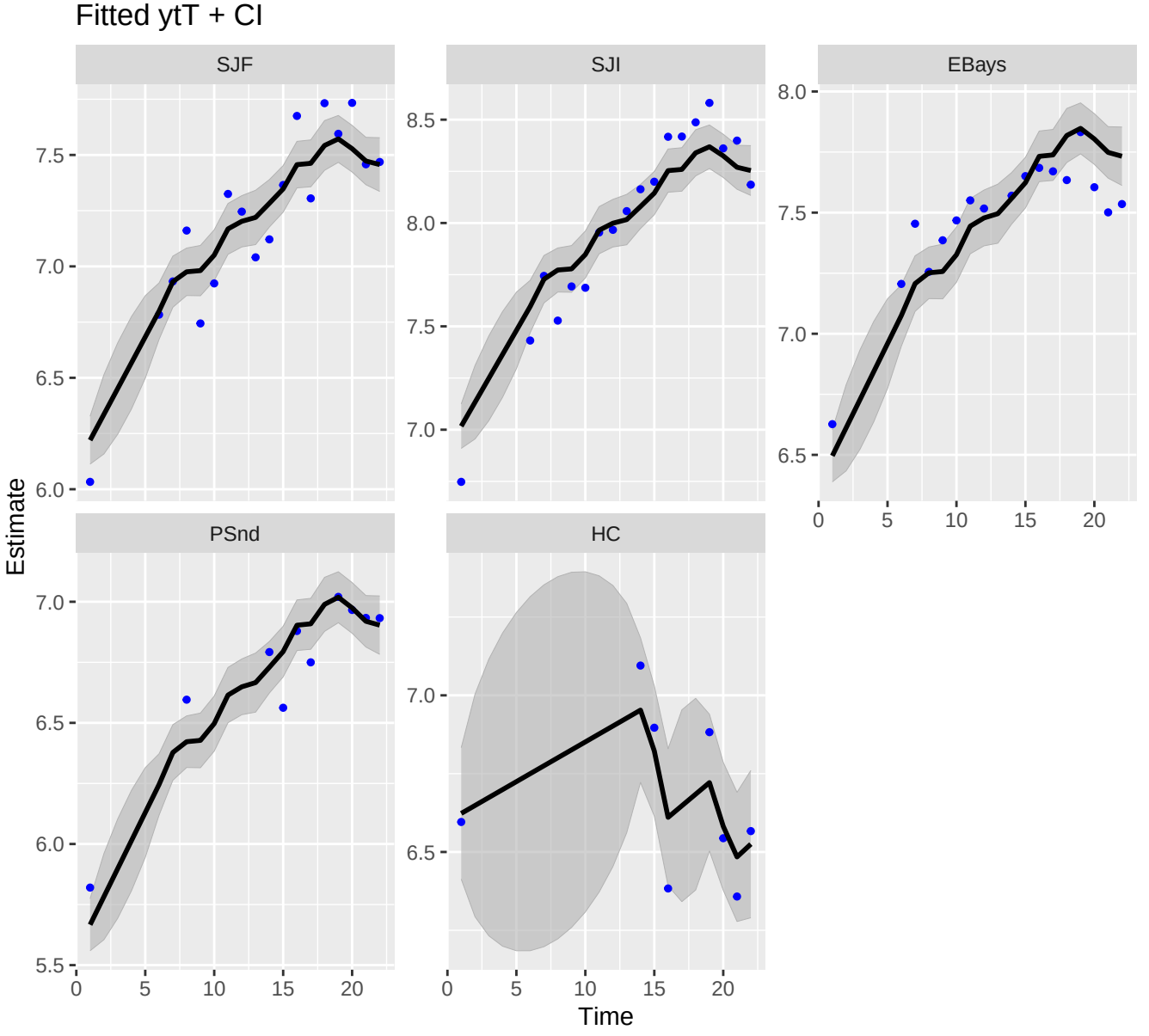

EBays + CI
Estimate
6.5
7.0
7.5
5
10
15
20


PSnd + CI
Estimate
6.0
6.5
7.0
5
10
15
20


HC + CI
Estimate
6.2
6.4
6.6
6.8
7.0
7.2
5
10
15
20



This is the model fitted value of Y conditioned on the data from t=1 to T. Use fitted.ytt1 if you want the one−step−ahead predictions instead. The CI is for the expected value of Y and the data points will not fall within the CI. Use prediction intervals to compare the data to intervals.



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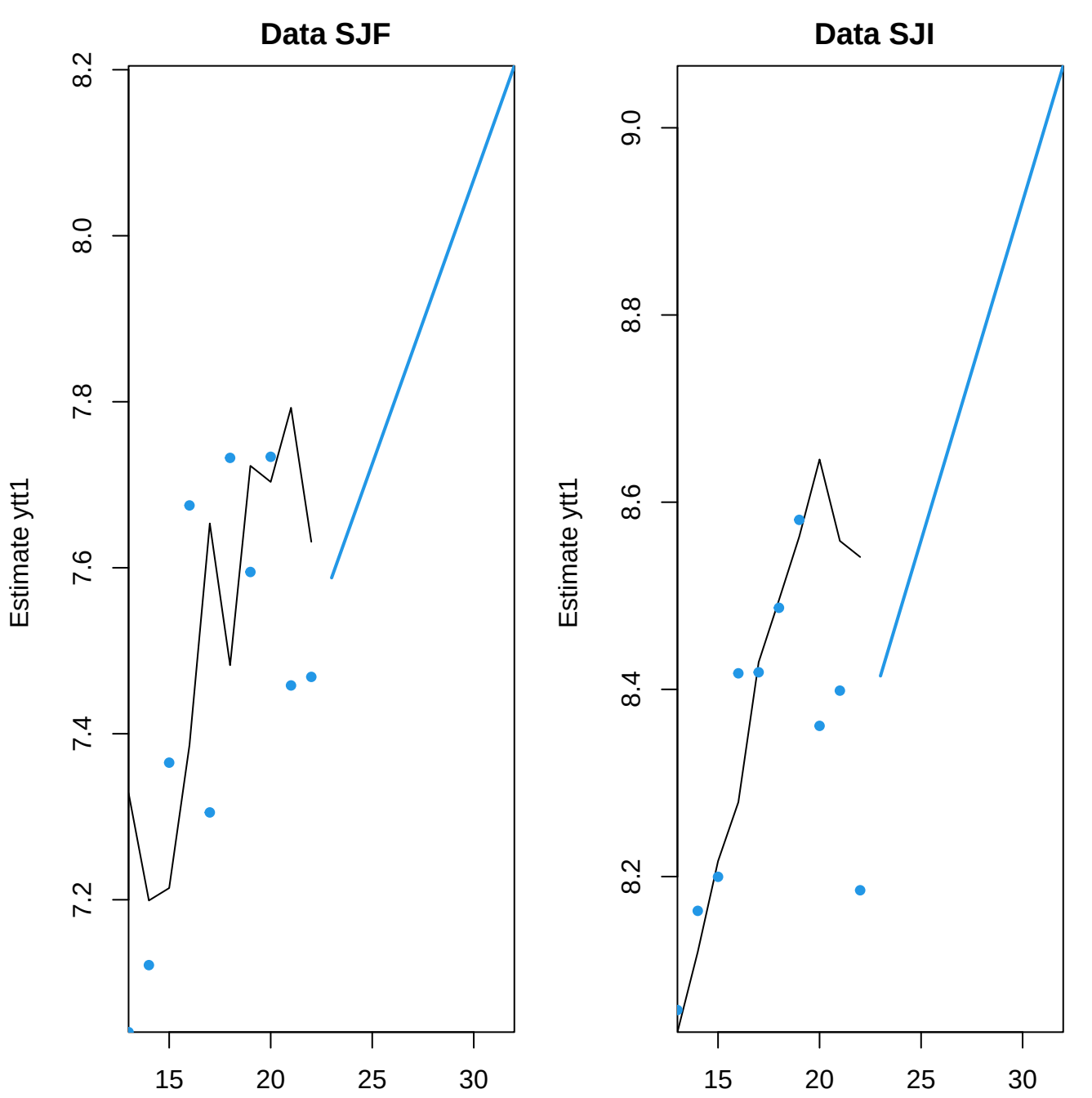
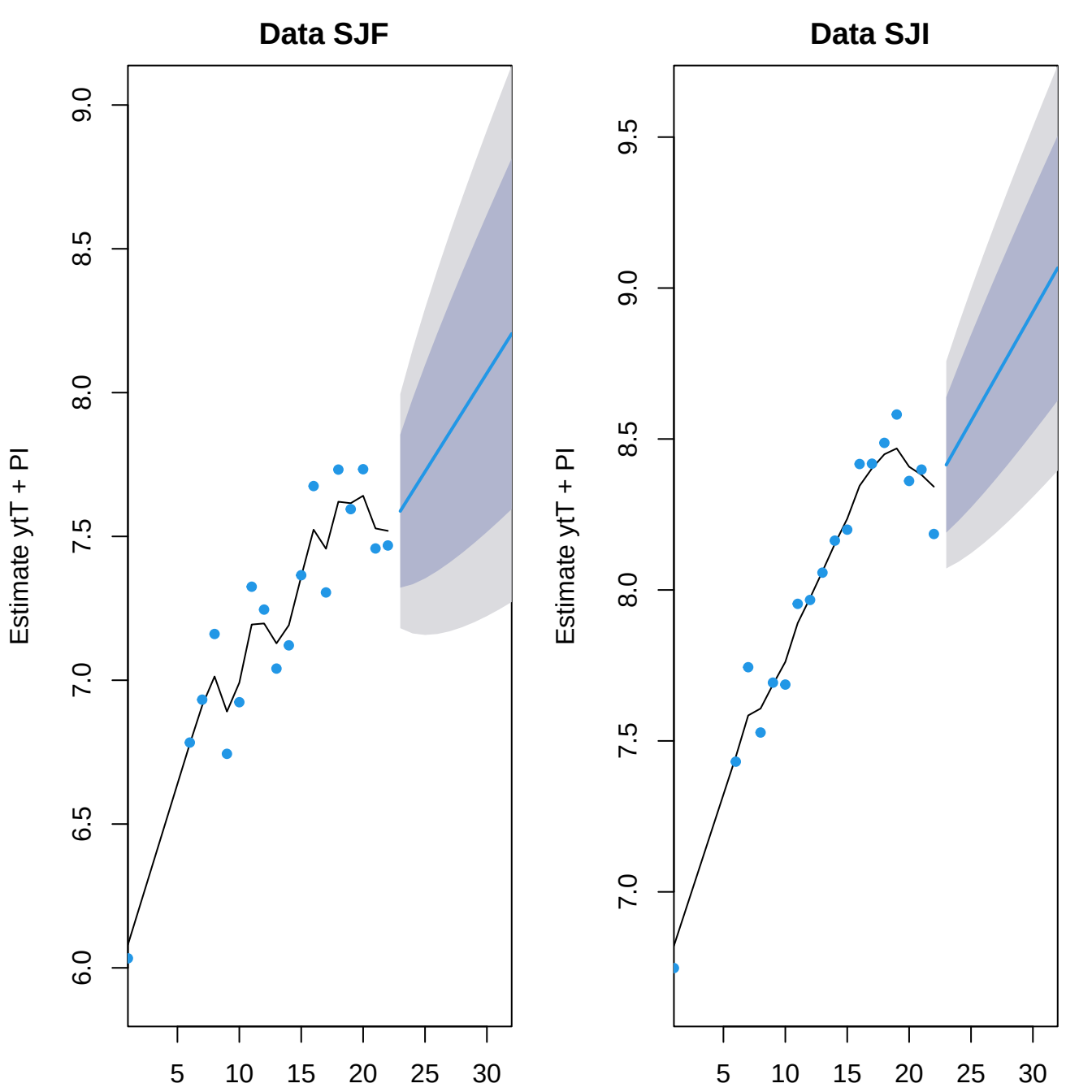
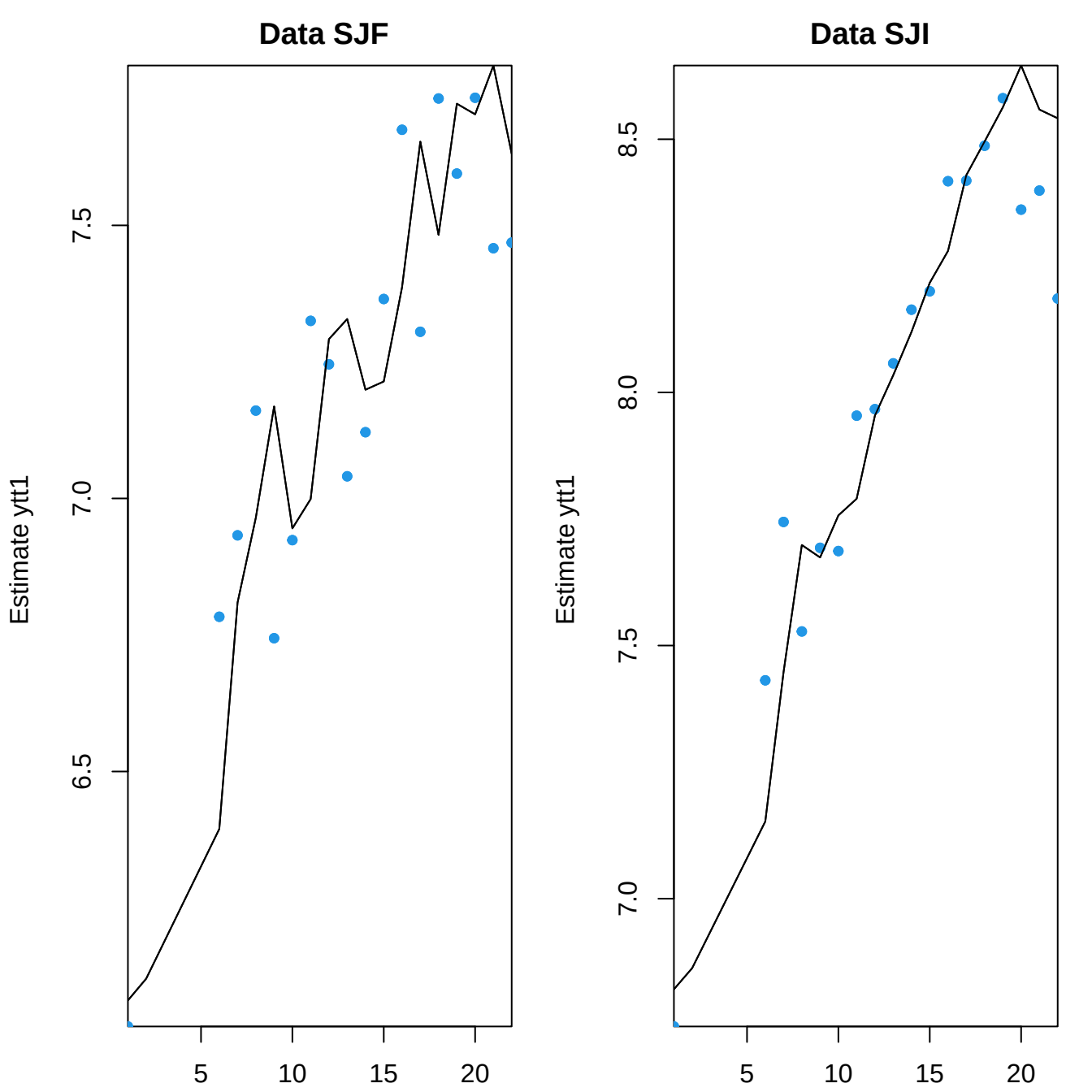
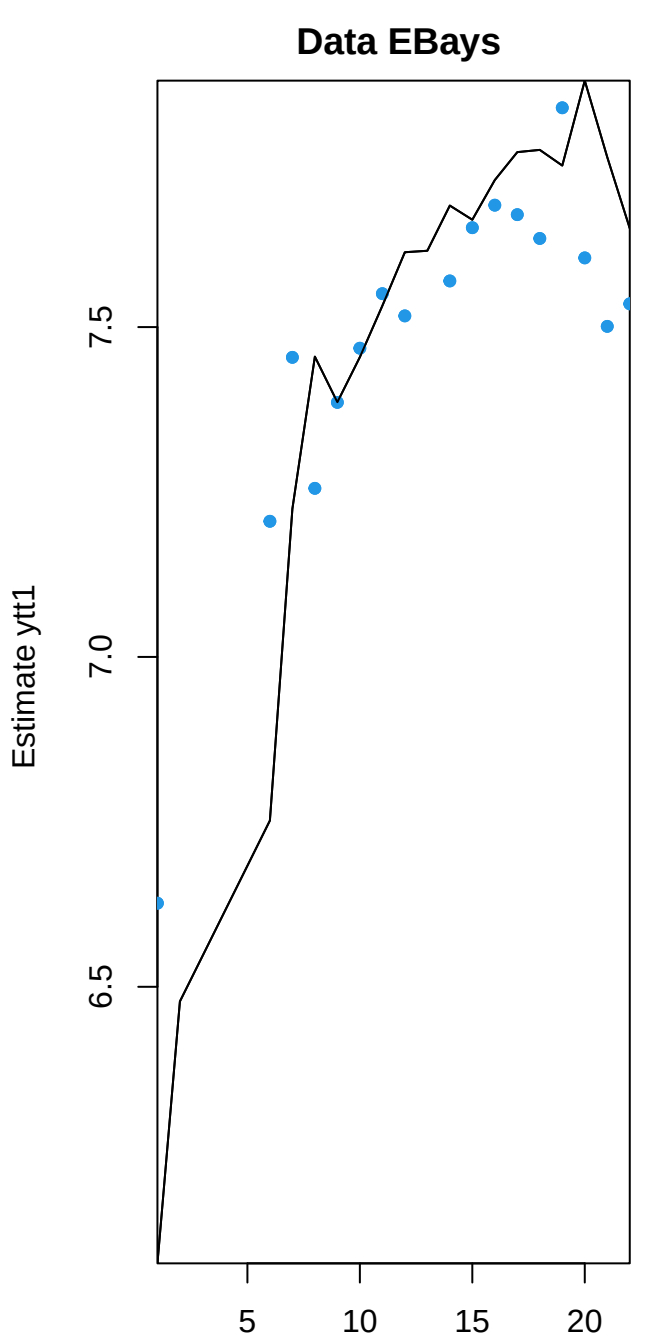
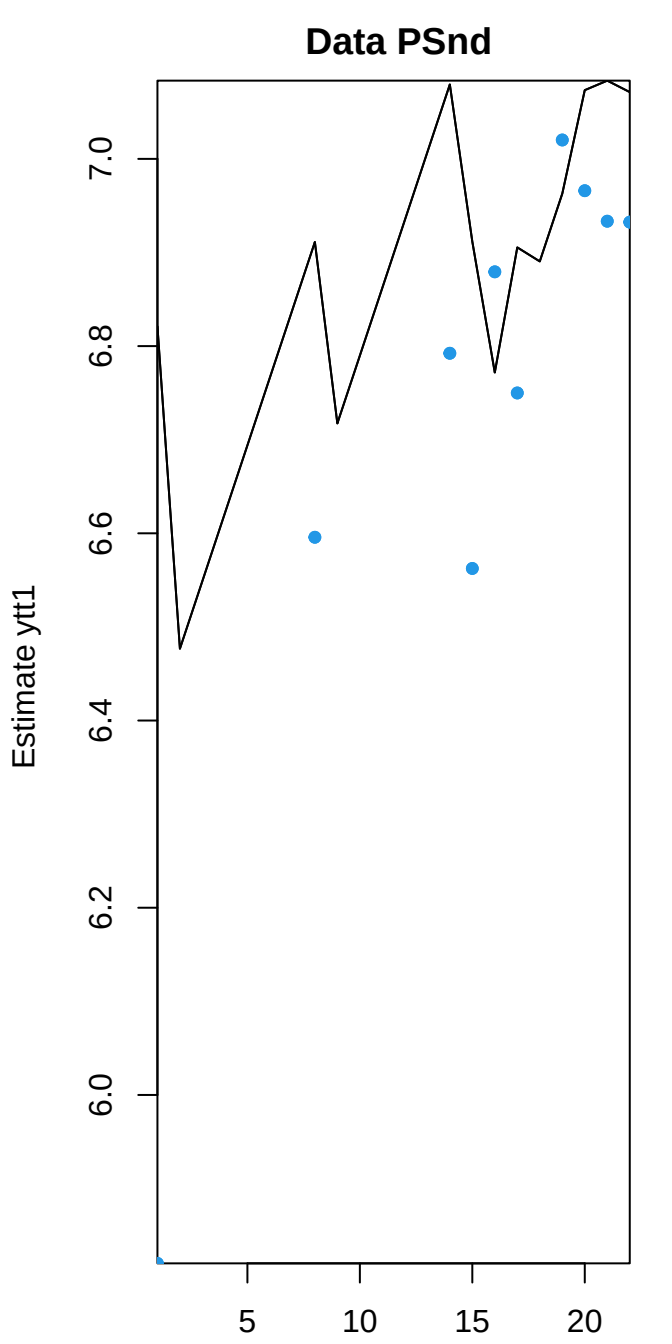
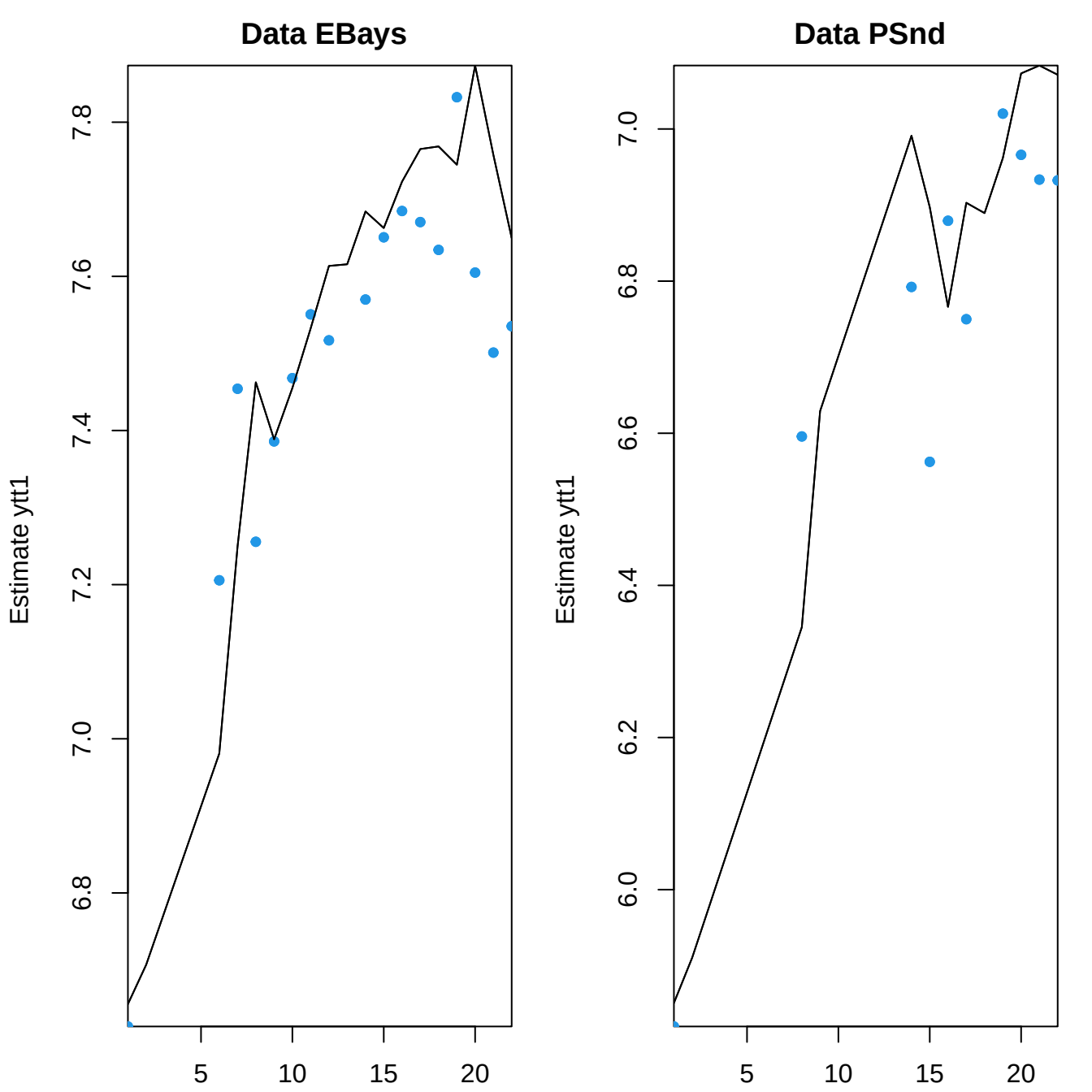

Data SJF
Estimate ytt1
8.2
8.0
7.8
7.6
7.4
7.2
15
20
25
30
Data SJI
Estimate ytt1
9.0
8.8
8.6
8.4
8.2
15
20
25
30

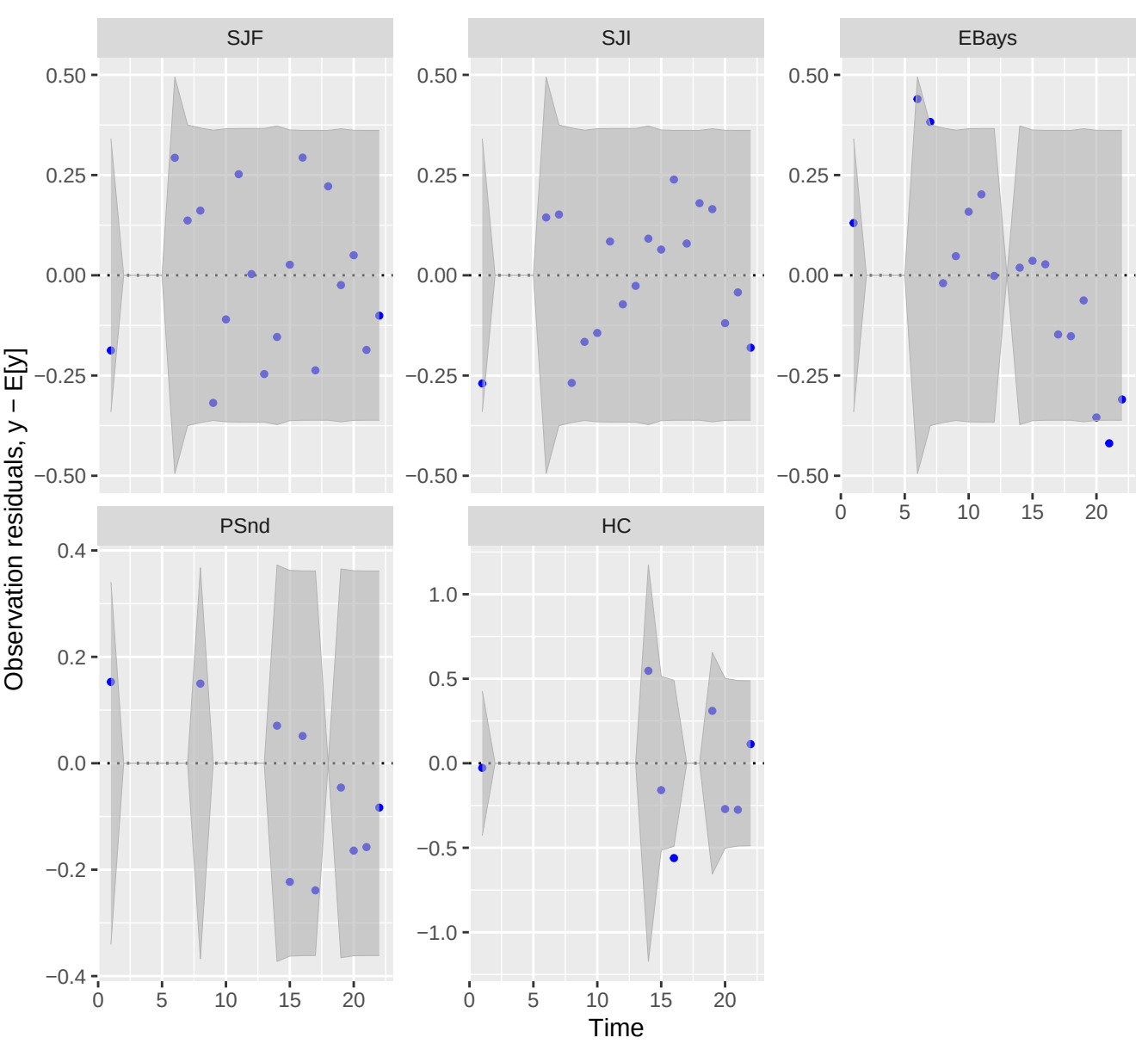

Data SJF
Estimate ytT + PI
6.0
6.5
7.0
7.5
8.0
8.5
9.0
5
10
15
20
25
30
Data SJI
Estimate ytT + PI
7.0
7.5
8.0
8.5
9.0
9.5
5
10
15
20
25
30


Data SJF
Estimate ytt1
6.5
7.0
7.5
5
10
15
20
Data SJI
Estimate ytt1
7.0
7.5
8.0
8.5
5
10
15
20

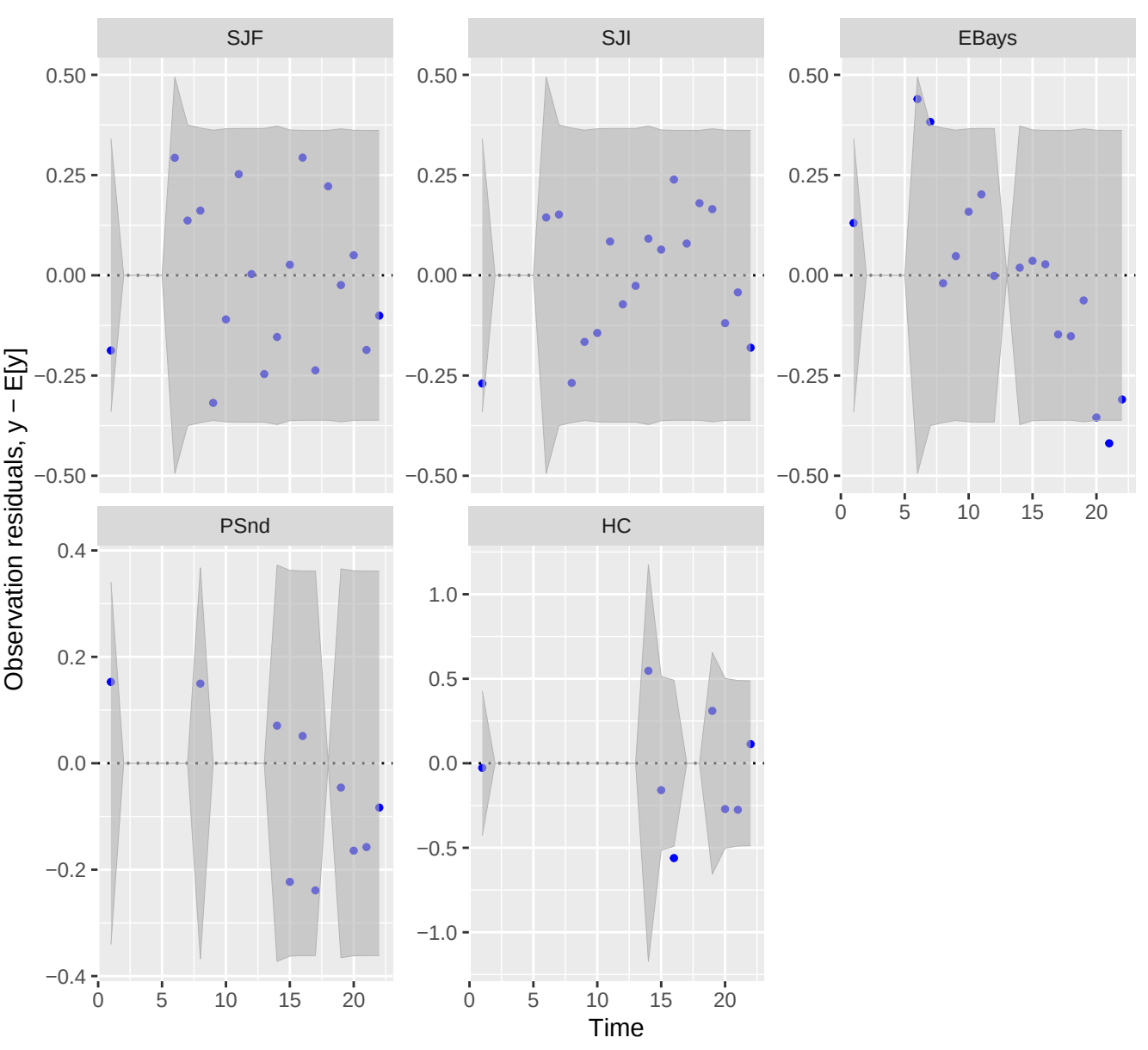

Data EBays
Estimate ytt1
6.5
7.0
7.5
5
10
15
20


Data PSnd
Estimate ytt1
6.0
6.2
6.4
6.6
6.8
7.0
5
10
15
20


Data EBays
Estimate ytt1
6.8
7.0
7.2
7.4
7.6
7.8
5
10
15
20
Data PSnd
Estimate ytt1
6.0
6.2
6.4
6.6
6.8
7.0
5
10
15
20



Innovations (one−step ahead) residuals.These residuals should not have a temporal trend and 95% of residuals should fall within the CIs. A violation of this indicates that the model cannot fit the data.



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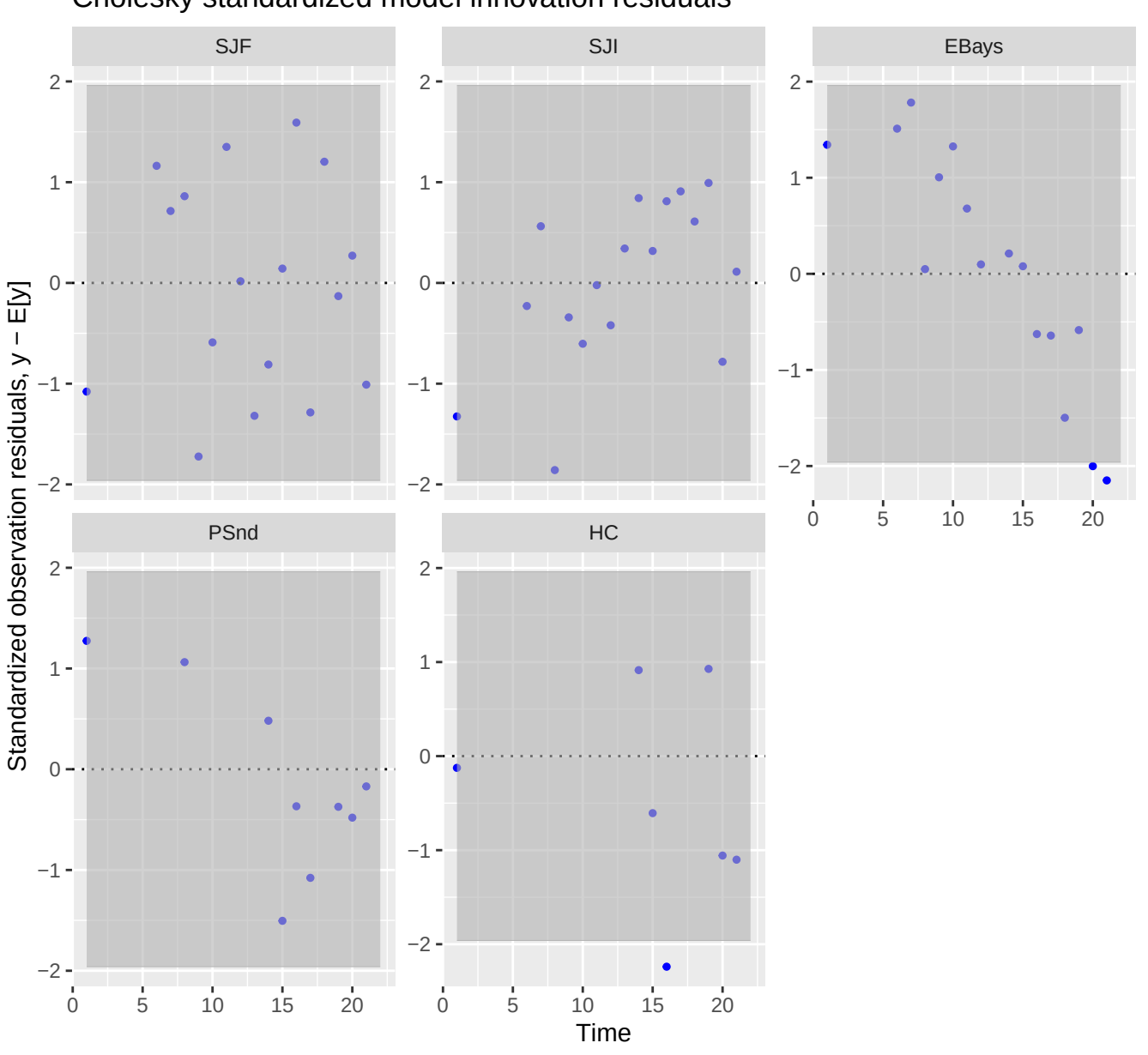
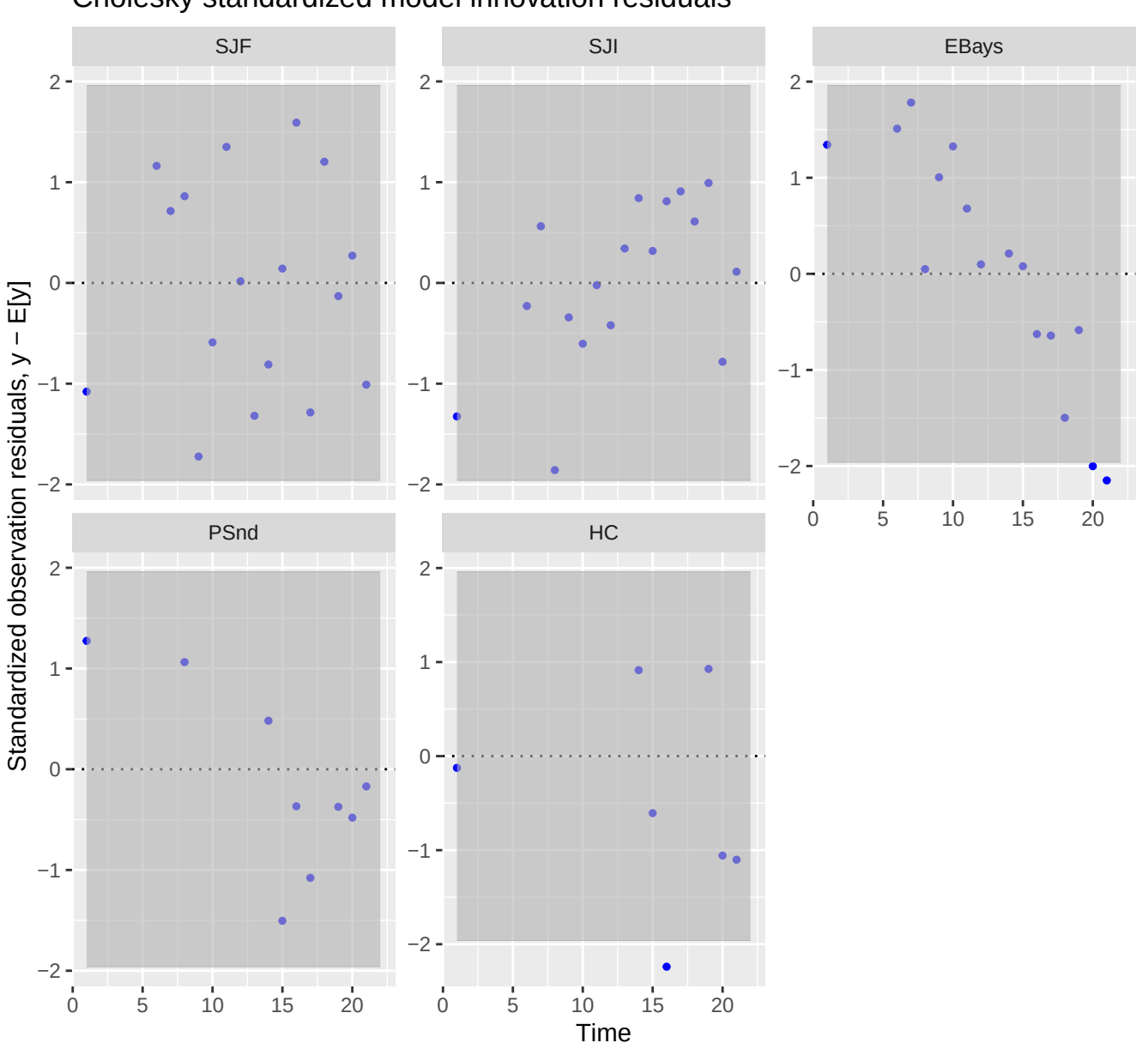


Cholesky standardized innovations residuals. Use standardized model smoothation (ytT) residuals (std.model.resids.ytT) for outlier detection.



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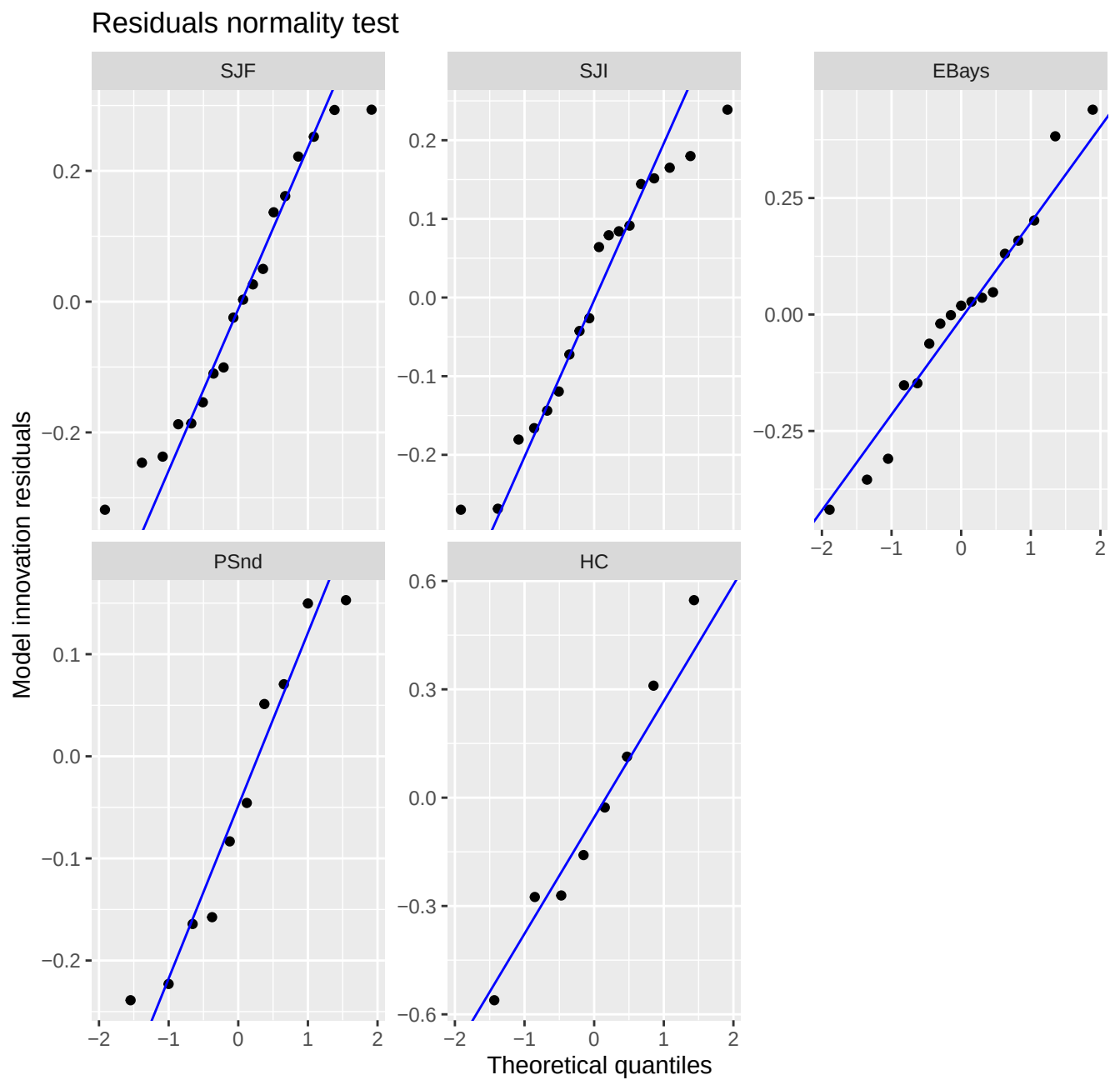
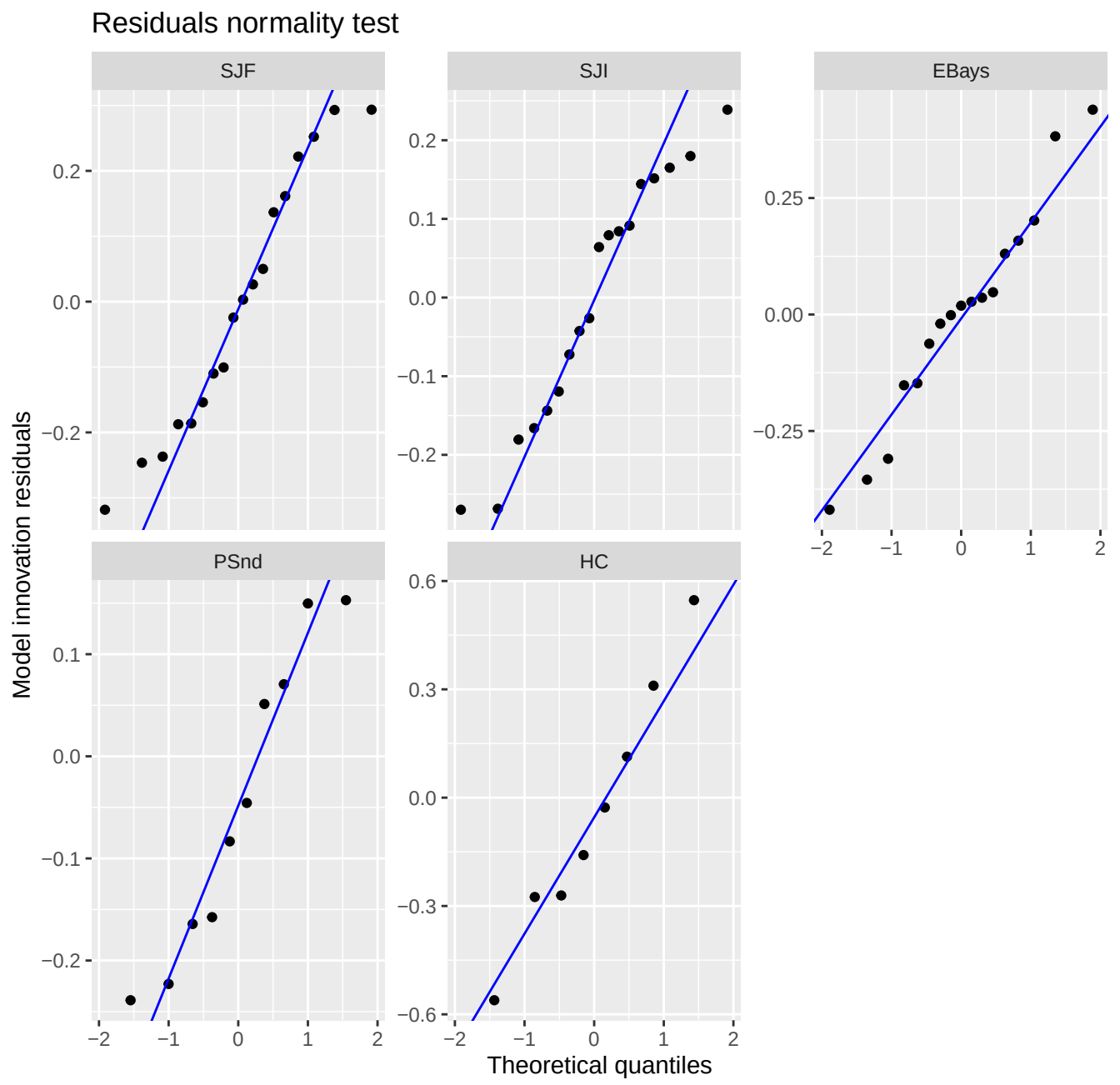

Residuals normality test
SJF
SJI
EBays
PSnd
HC
Model innovation residuals
Theoretical quantiles
Model innovation (ytt1) residuals. The residuals should be Gaussian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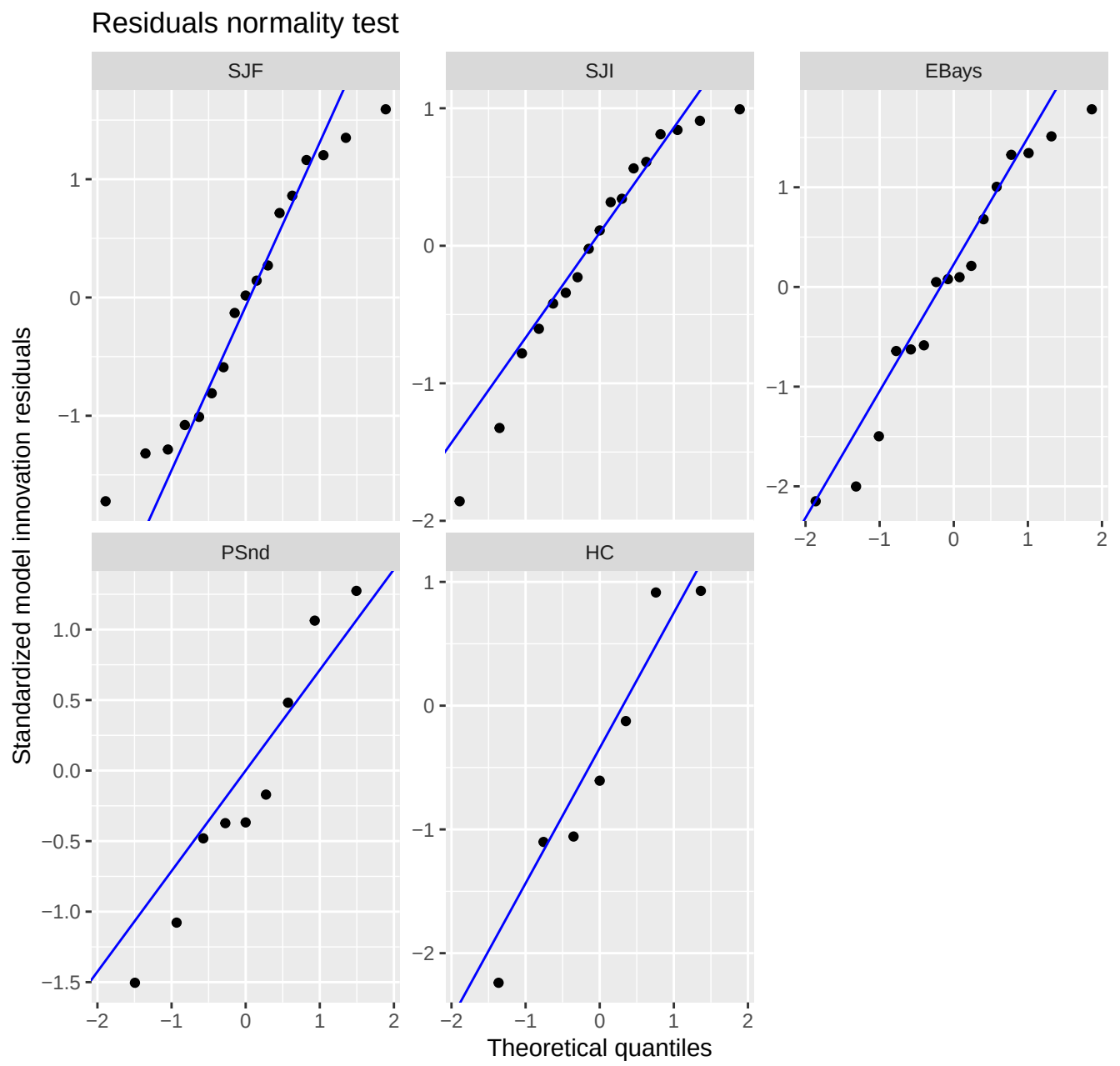
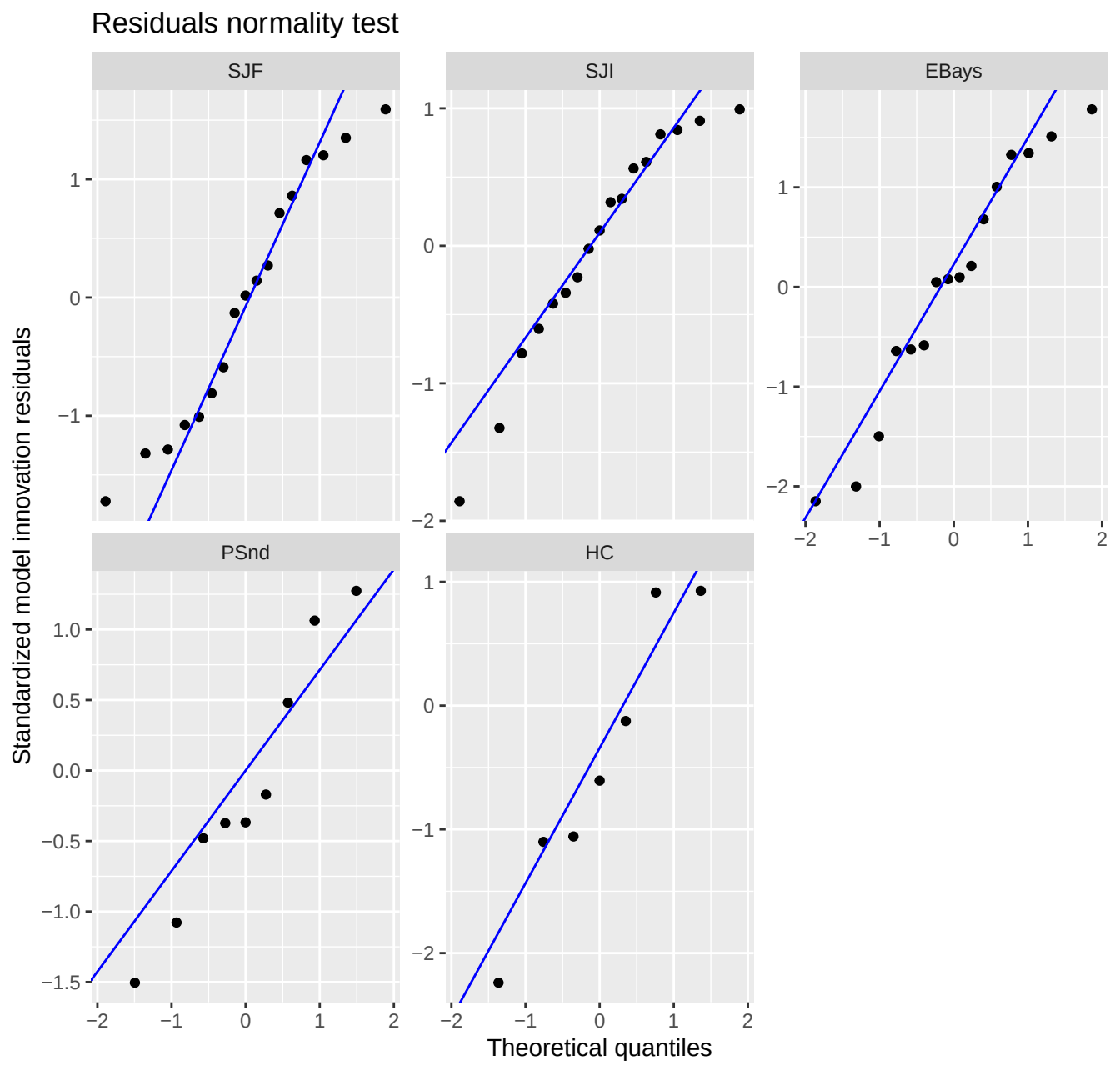
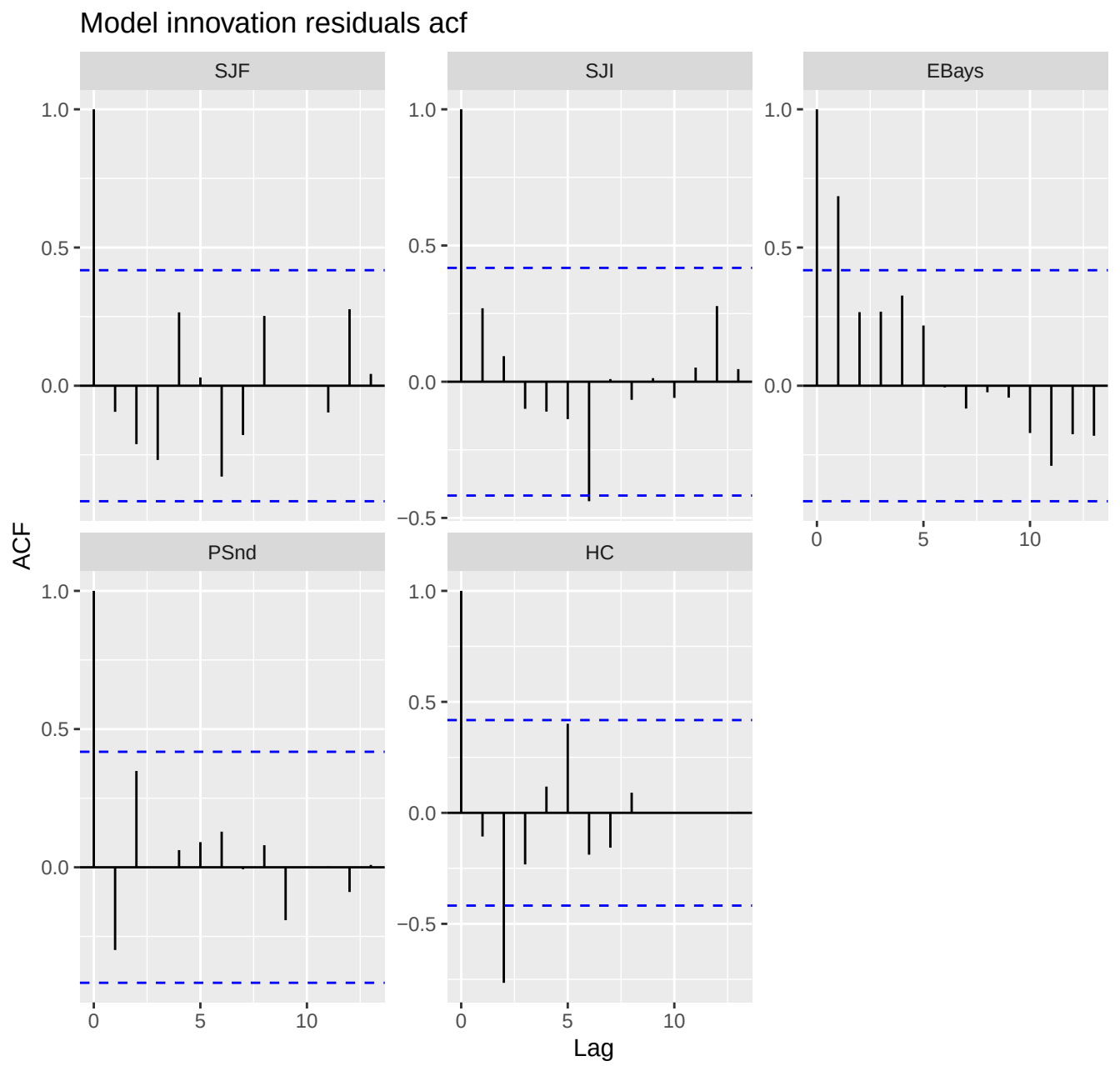


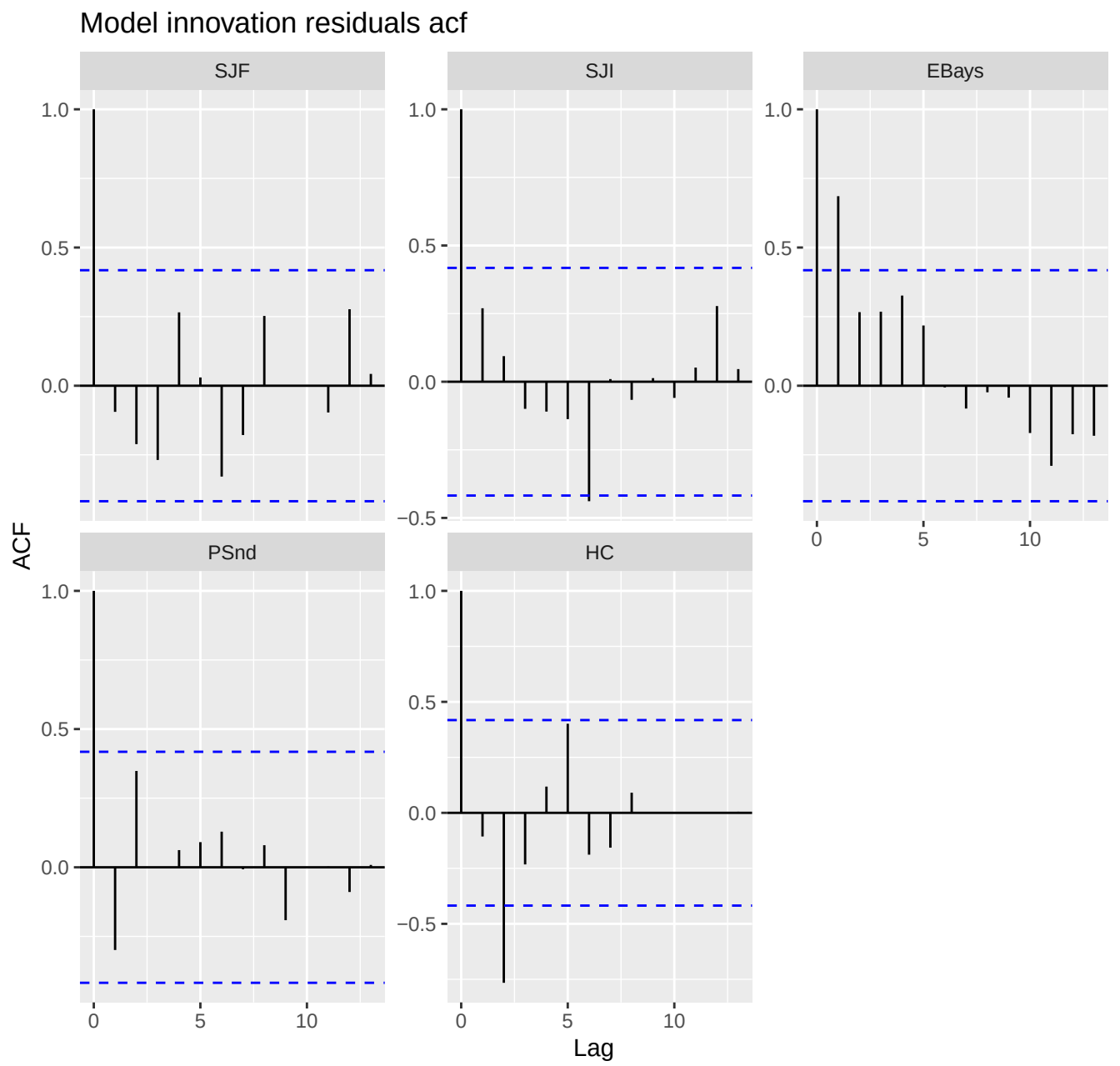
Cholesky standardized model innovation (ytt1) residuals. The residuals should be Gaussian



Cholesky standardized model innovation (ytt1) residuals. The residuals should be Gaussian



Model innovation (ytt1) residuals. These residuals should be temporally uncorrelated.



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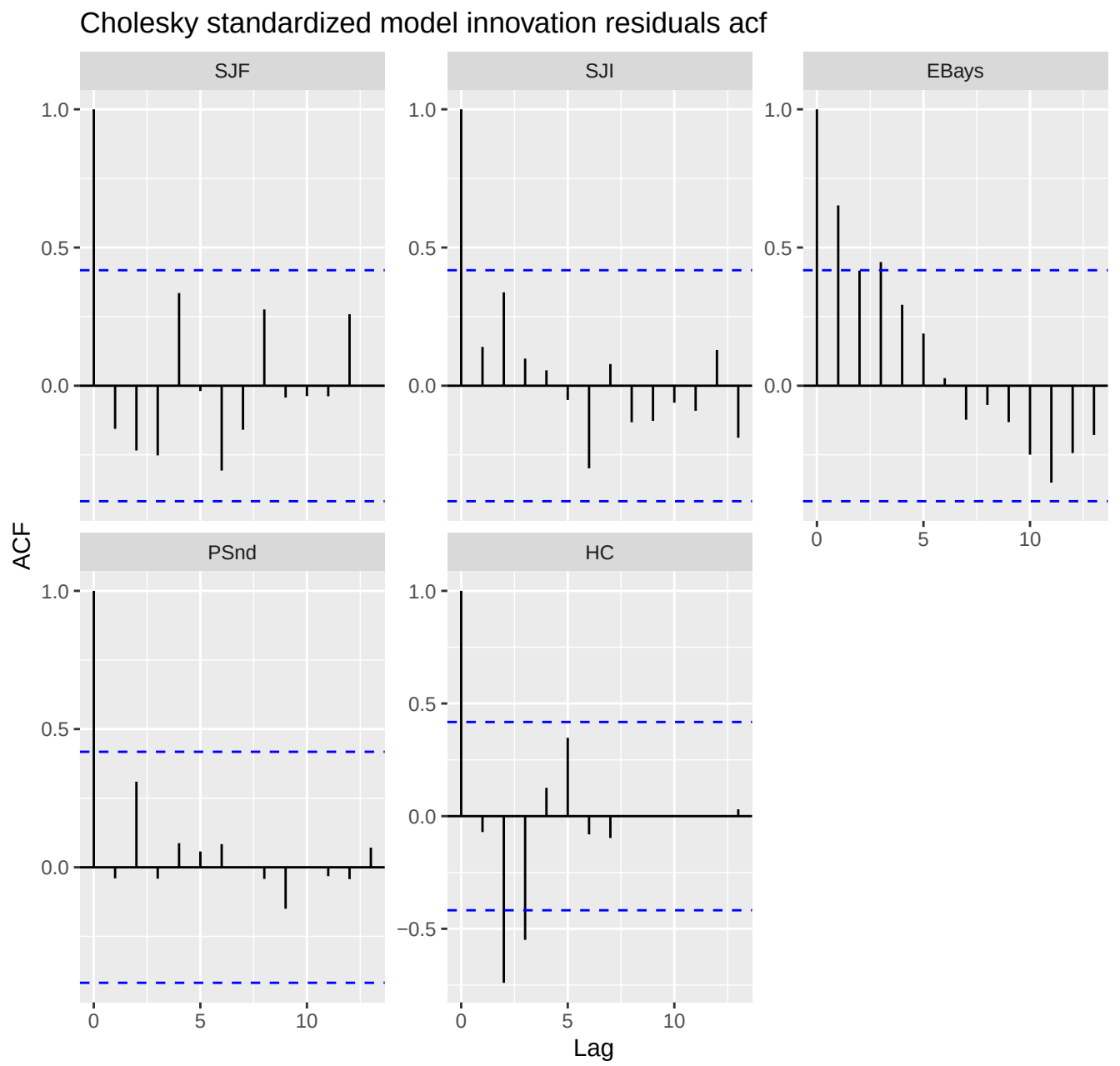

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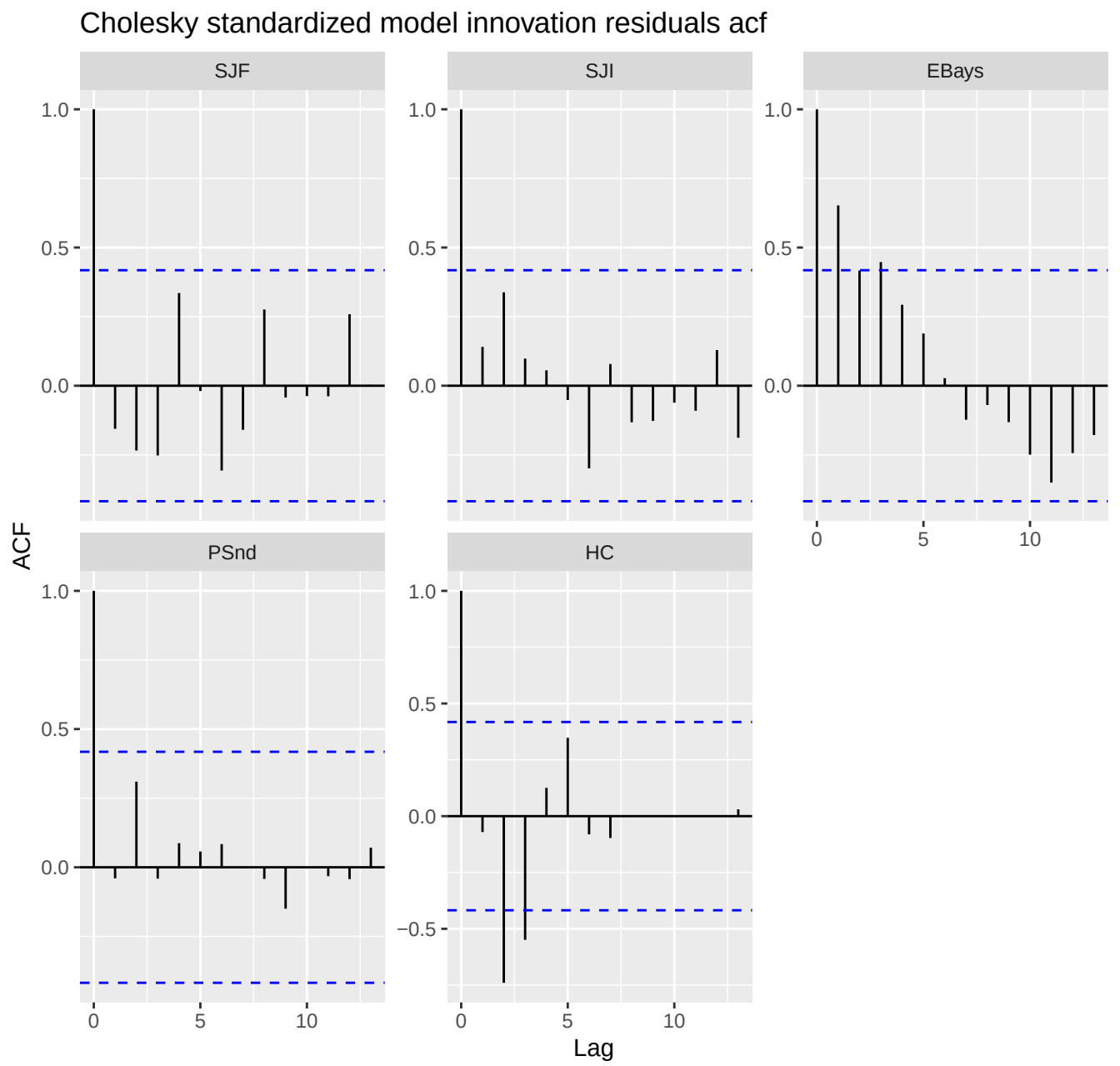

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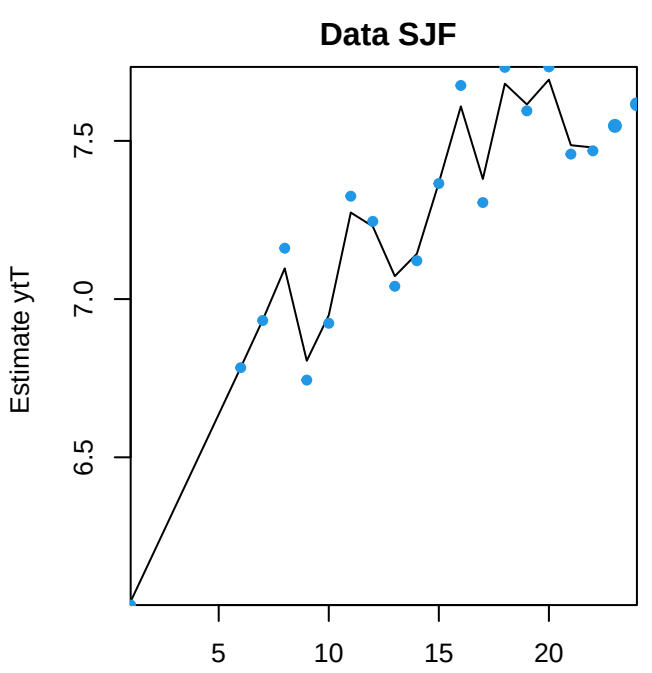
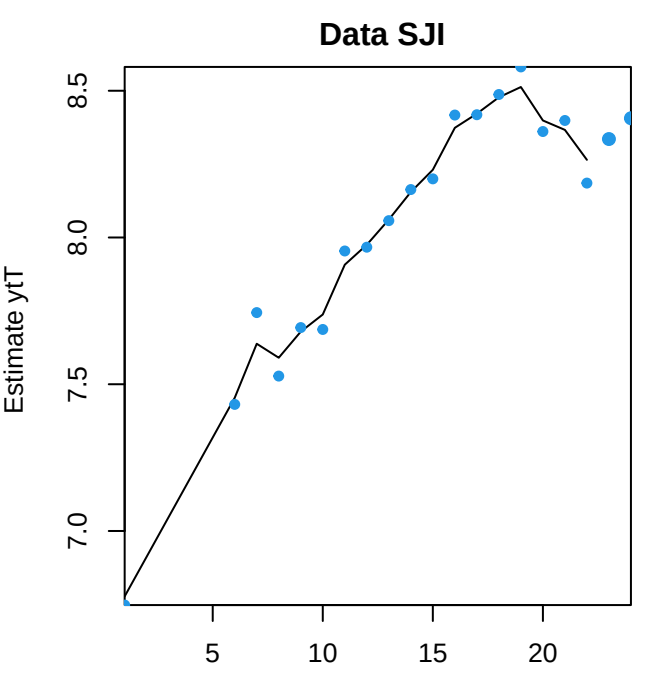
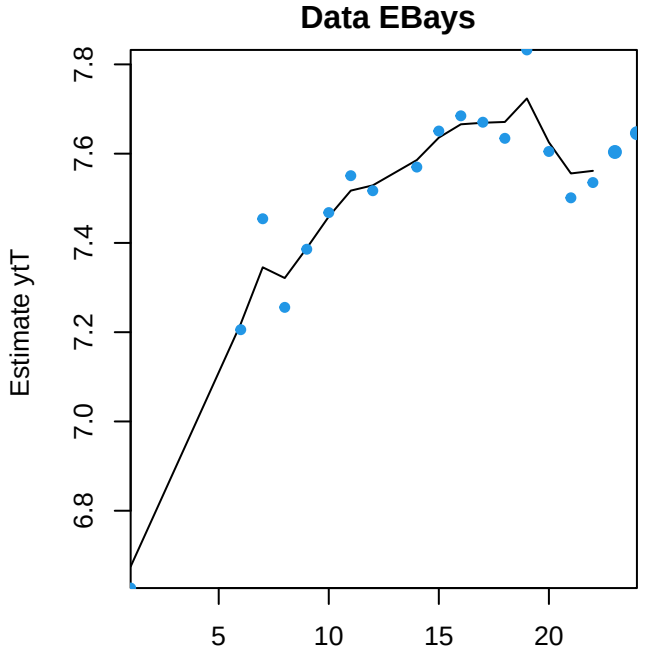
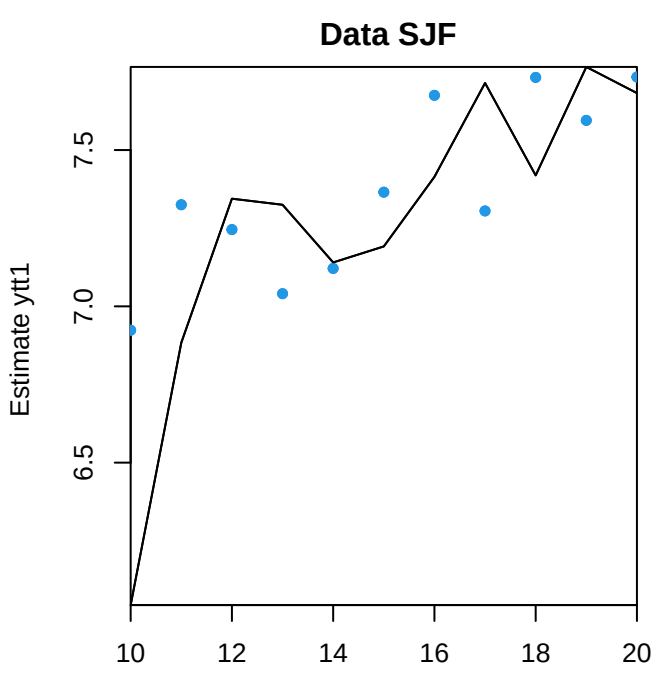
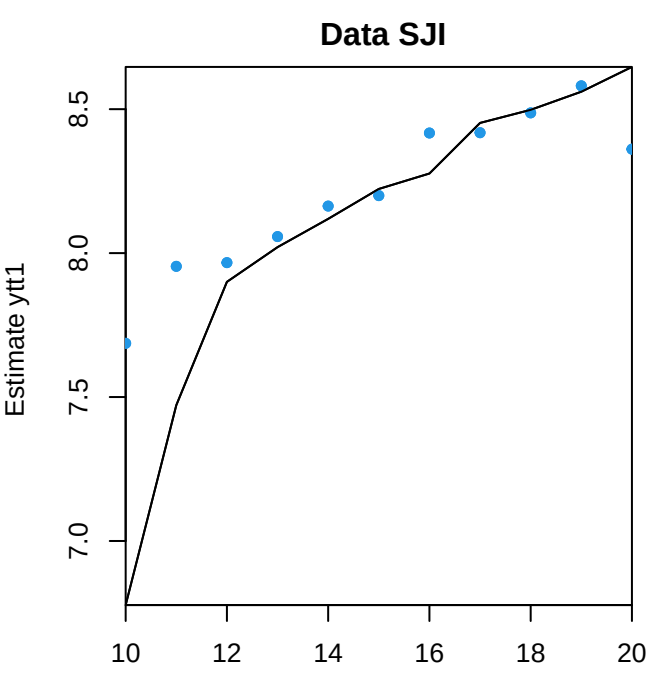
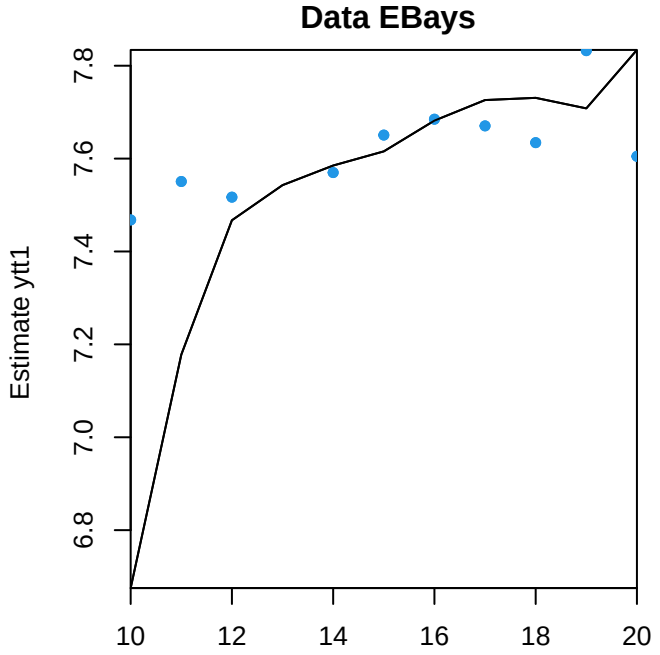

Data SJF
Estimate ytT
6.5
7.0
7.5
5
10
15
20

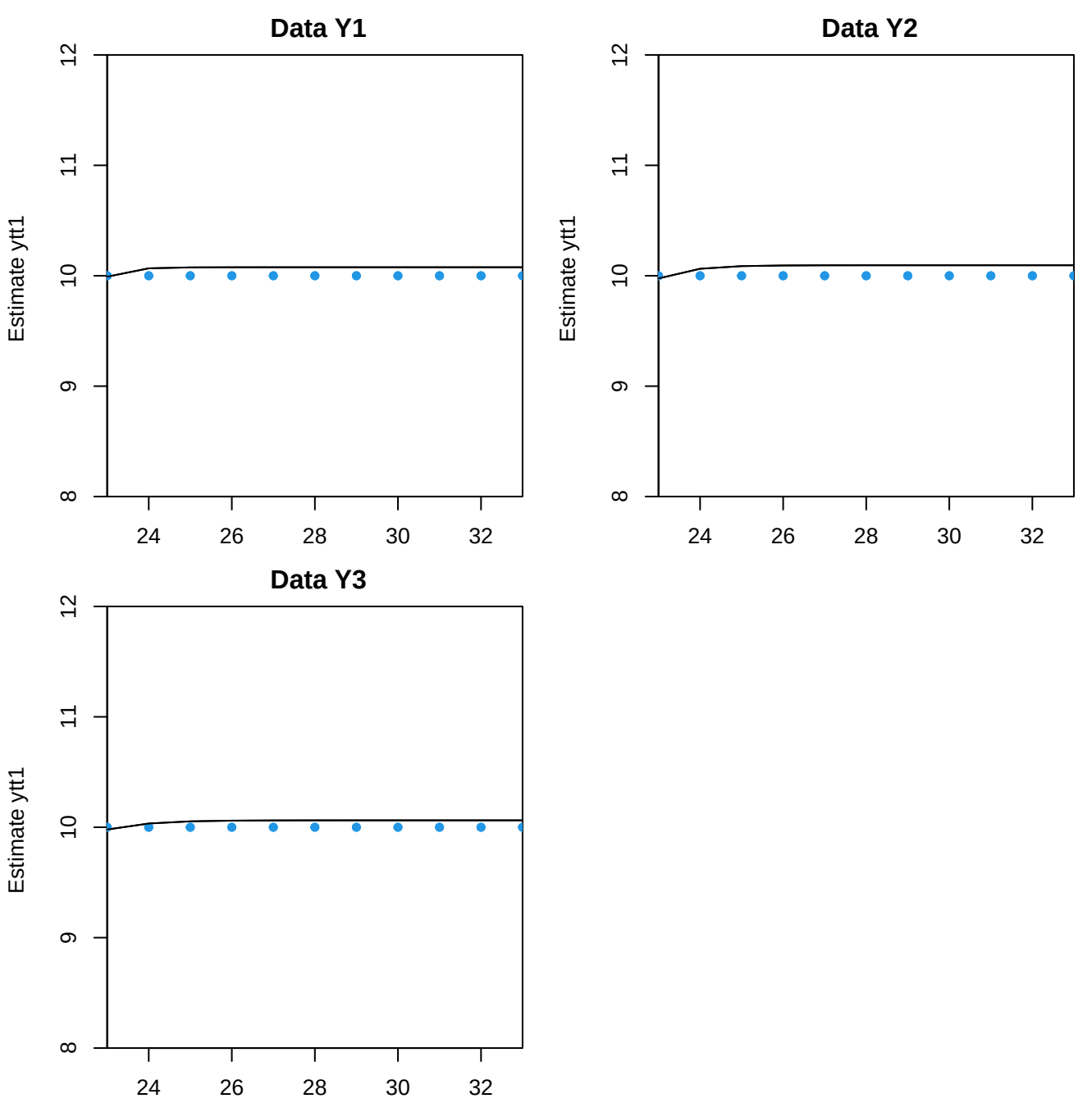

Data SJI
Estimate ytT
7.0
7.5
8.0
8.5
5
10
15
20

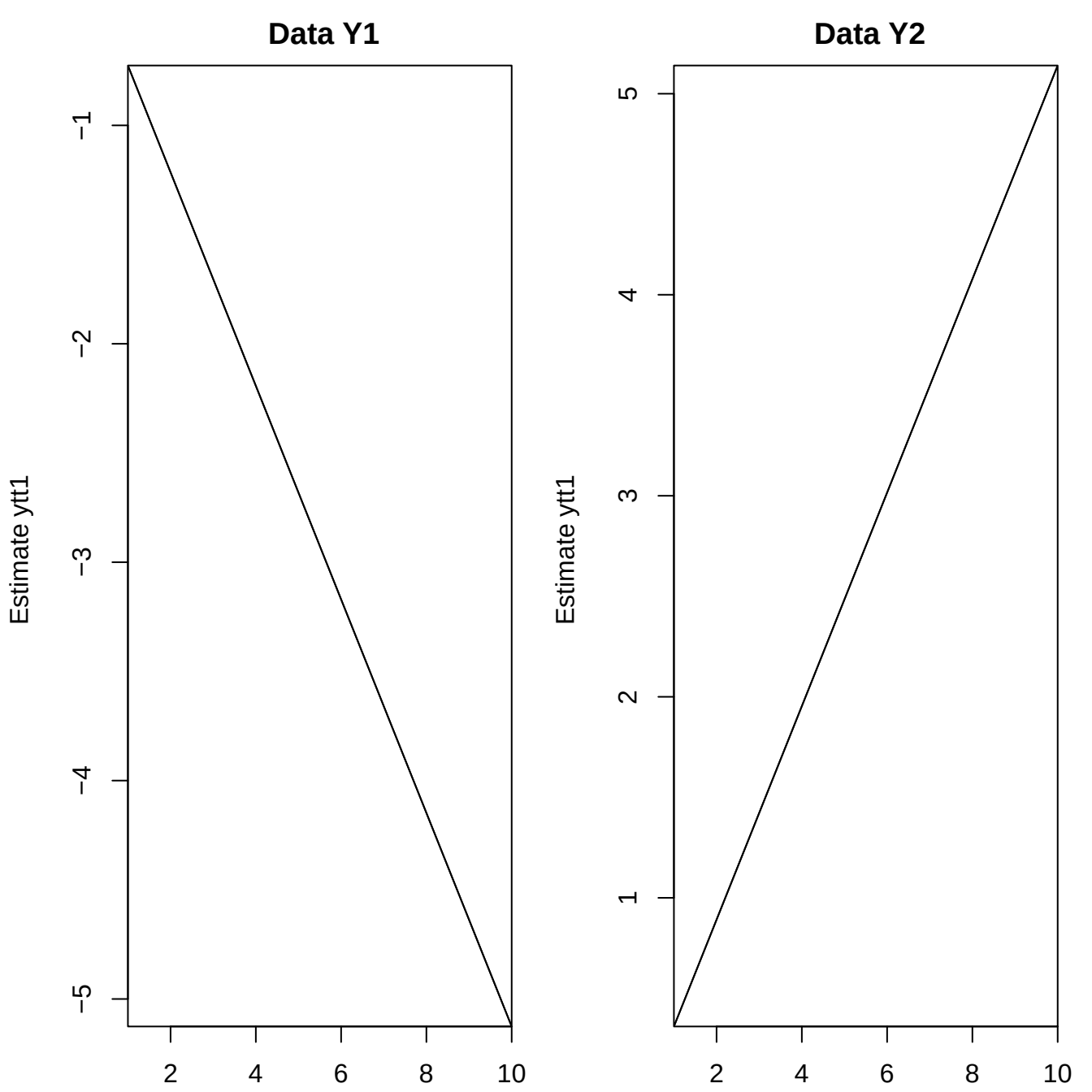

Data EBays
Estimate ytT
6.8
7.0
7.2
7.4
7.6
7.8
5
10
15
20

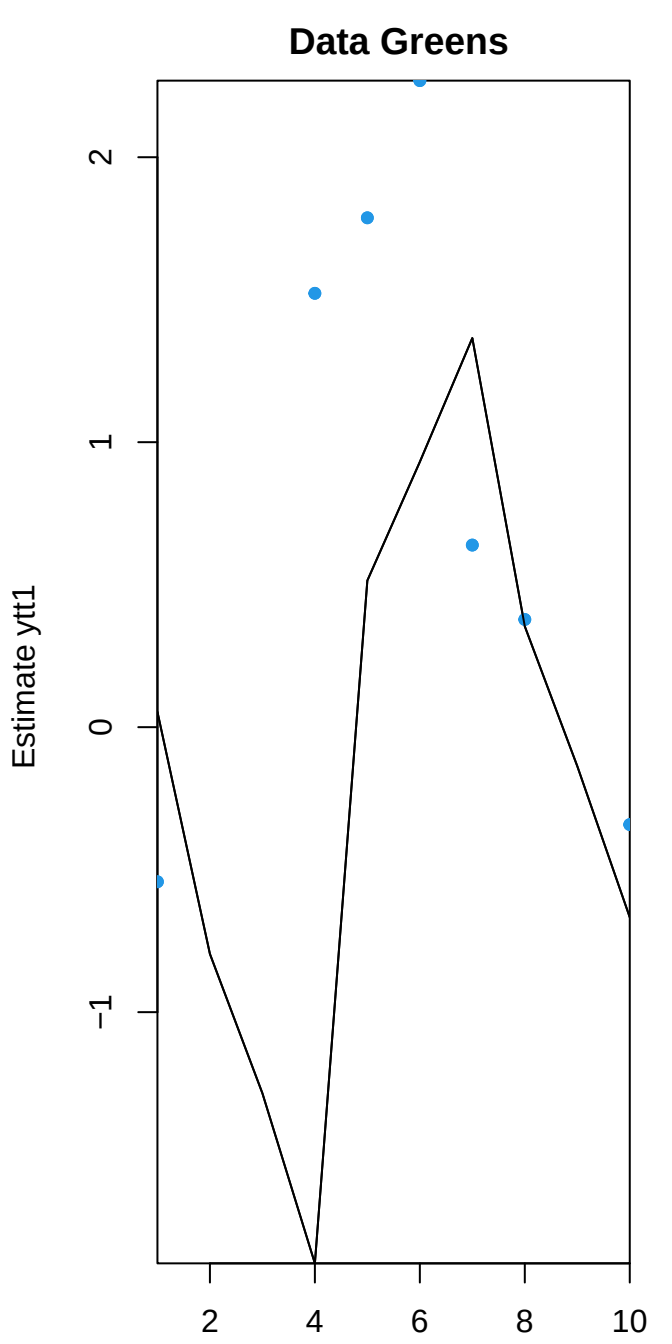

Data SJF
Estimate ytt1
6.5
7.0
7.5
10
12
14
16
18
20

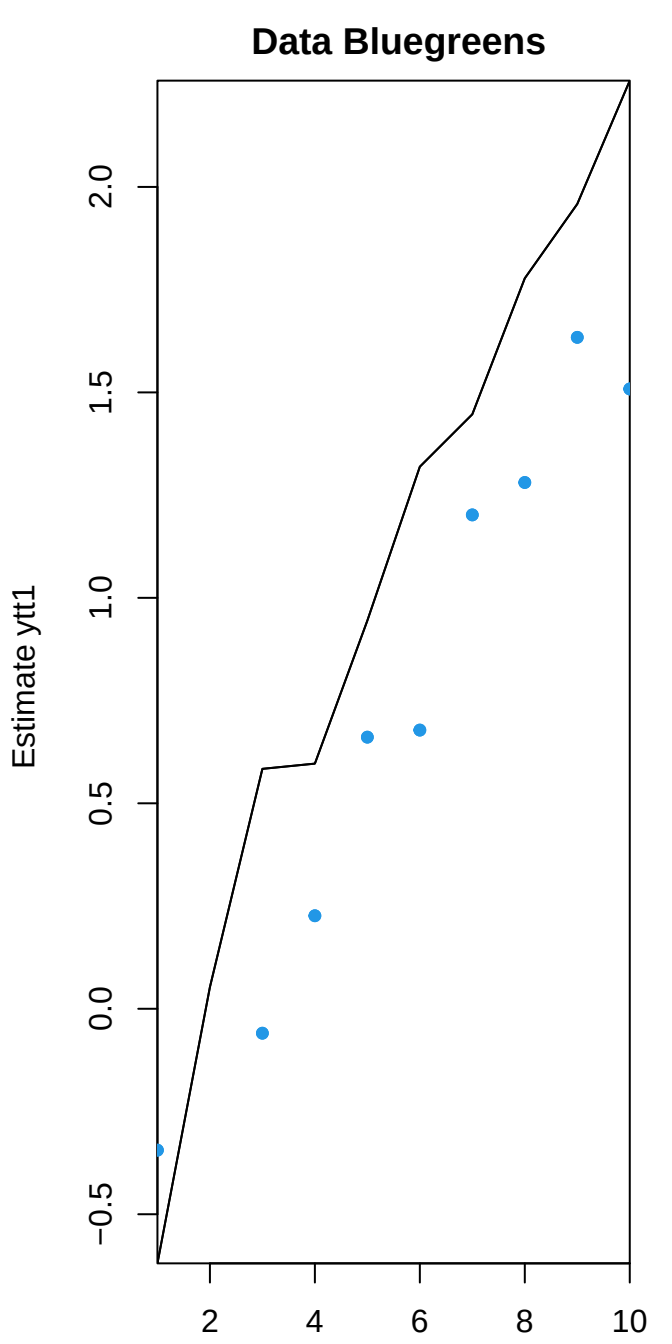

Data SJI
Estimate ytt1
7.0
7.5
8.0
8.5
10
12
14
16
18
20

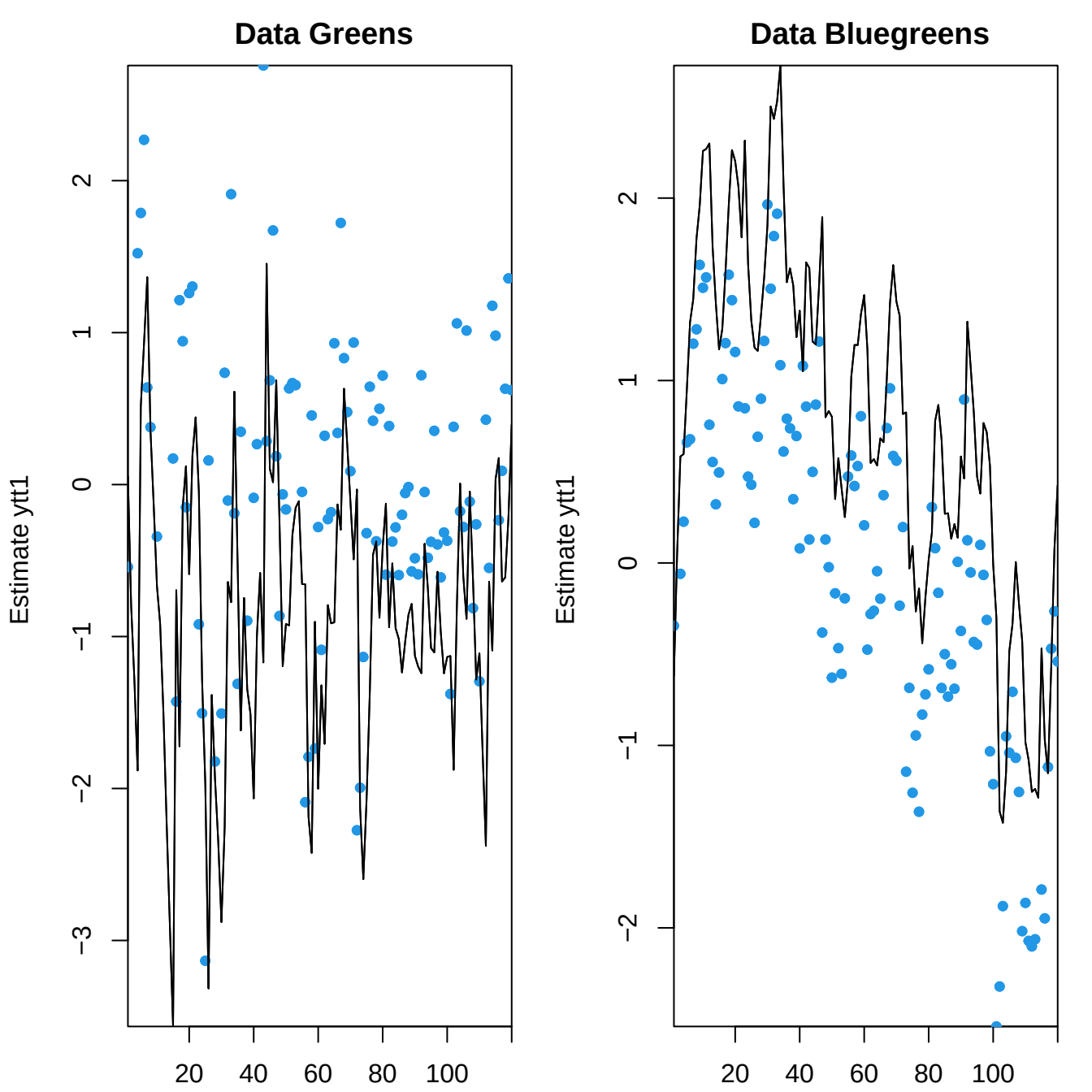

Data EBays
Estimate ytt1
6.8
7.0
7.2
7.4
7.6
7.8
10
12
14
16
18
20

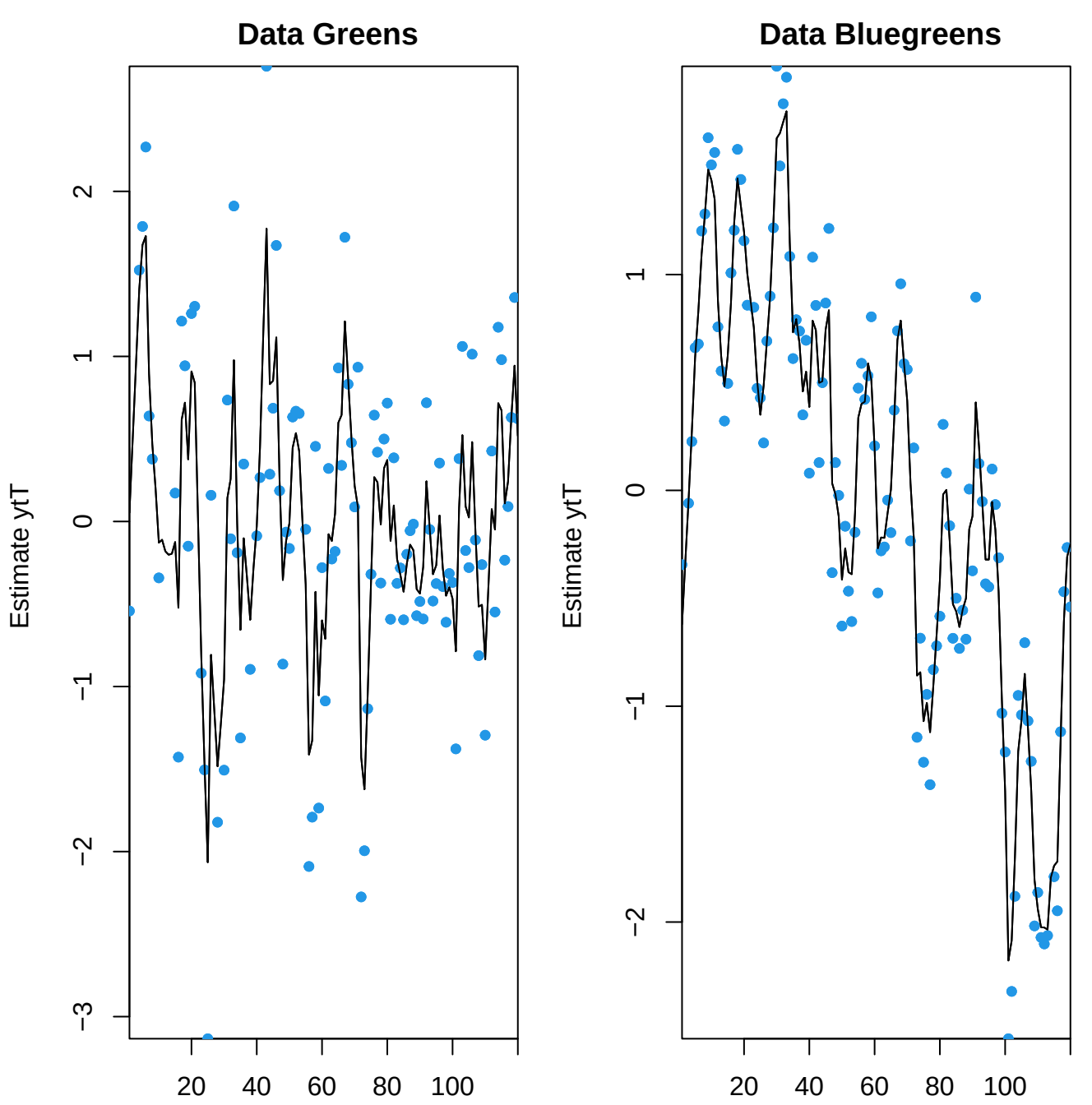

Data Y1
Estimate ytt1
8
9
10
11
12
24
26
28
30
32
Data Y2
Estimate ytt1
8
9
10
11
12
24
26
28
30
32
Data Y3
Estimate ytt1
8
9
10
11
12
24
26
28
30
32

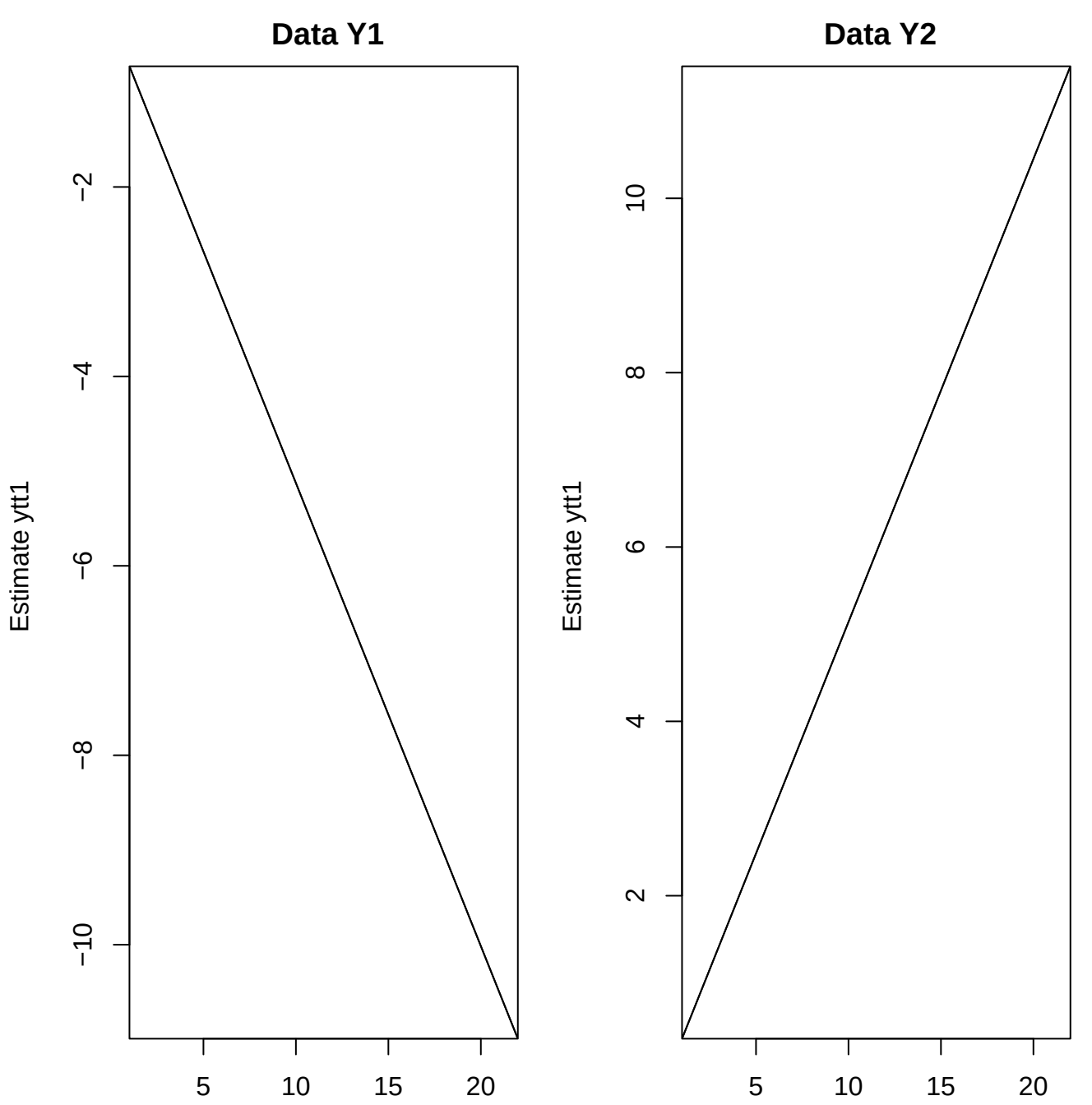

Data Y1
Estimate ytt1
−1
−2
−3
−4
−5
2
4
6
8
10
Data Y2
Estimate ytt1
5
4
3
2
1
2
4
6
8
10

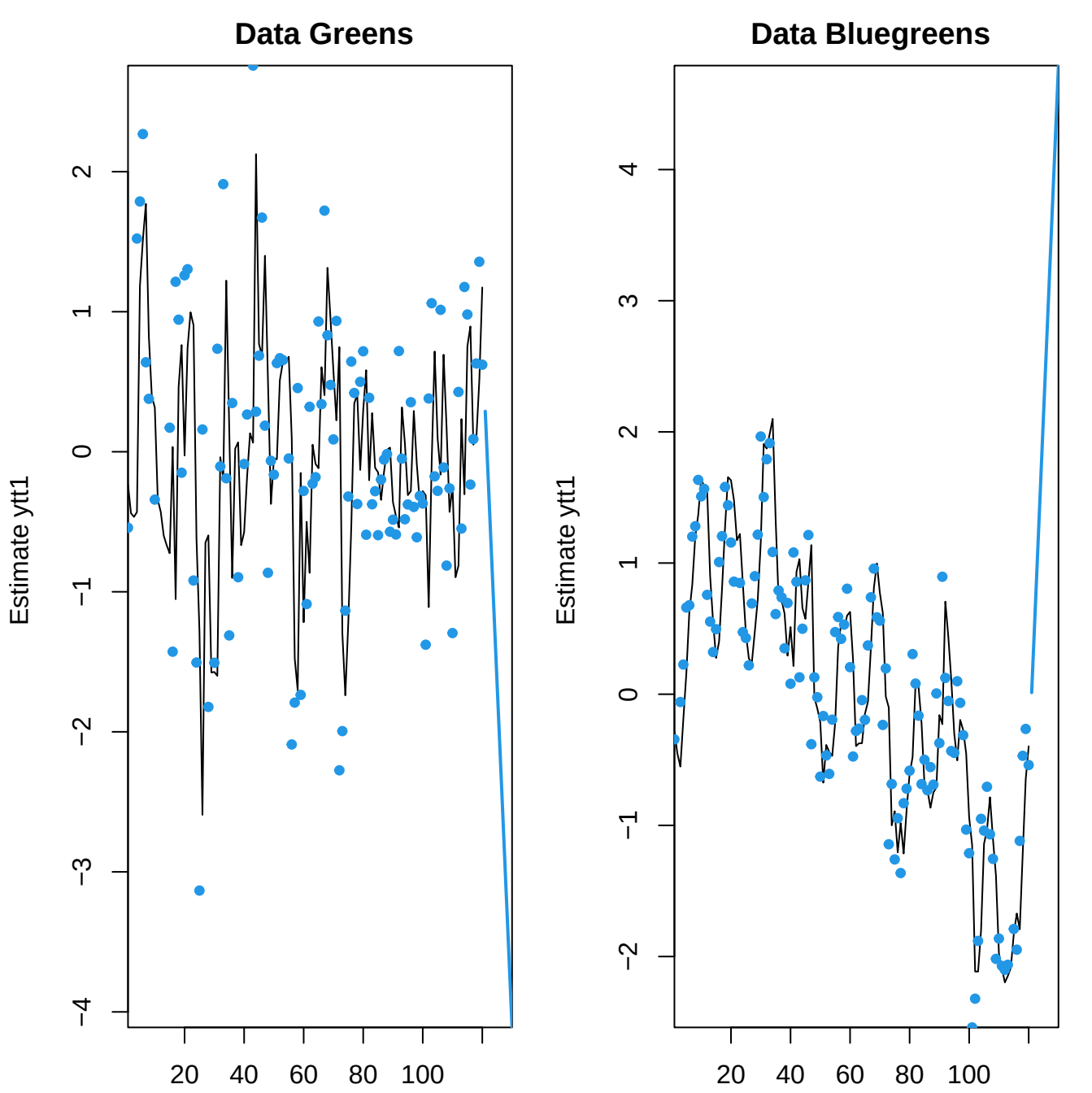

Data Greens
Estimate ytt1
2
1
0
−1
2
4
6
8
10

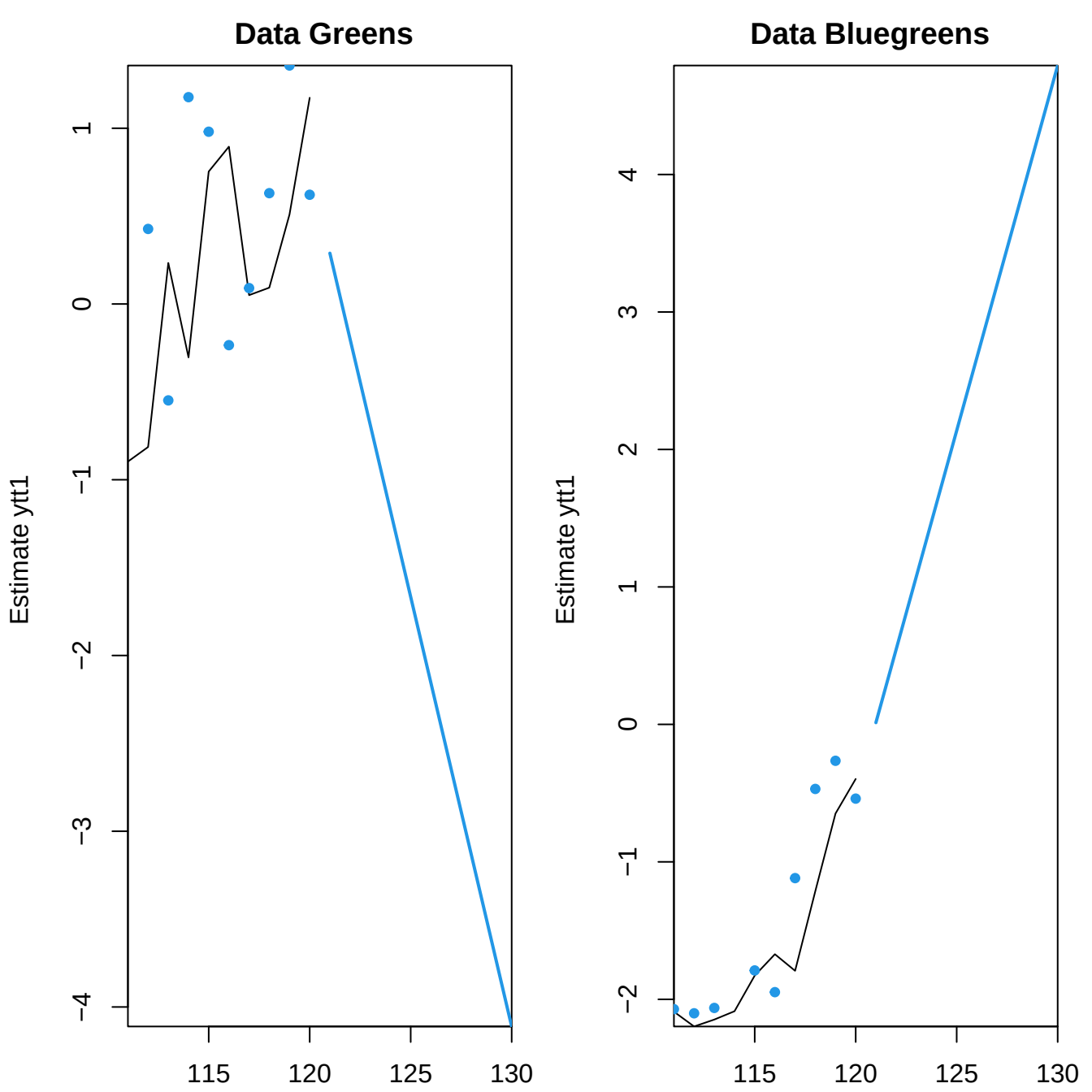

Data Bluegreens
Estimate ytt1
2.0
1.5
1.0
0.5
0.0
−0.5
2
4
6
8
10

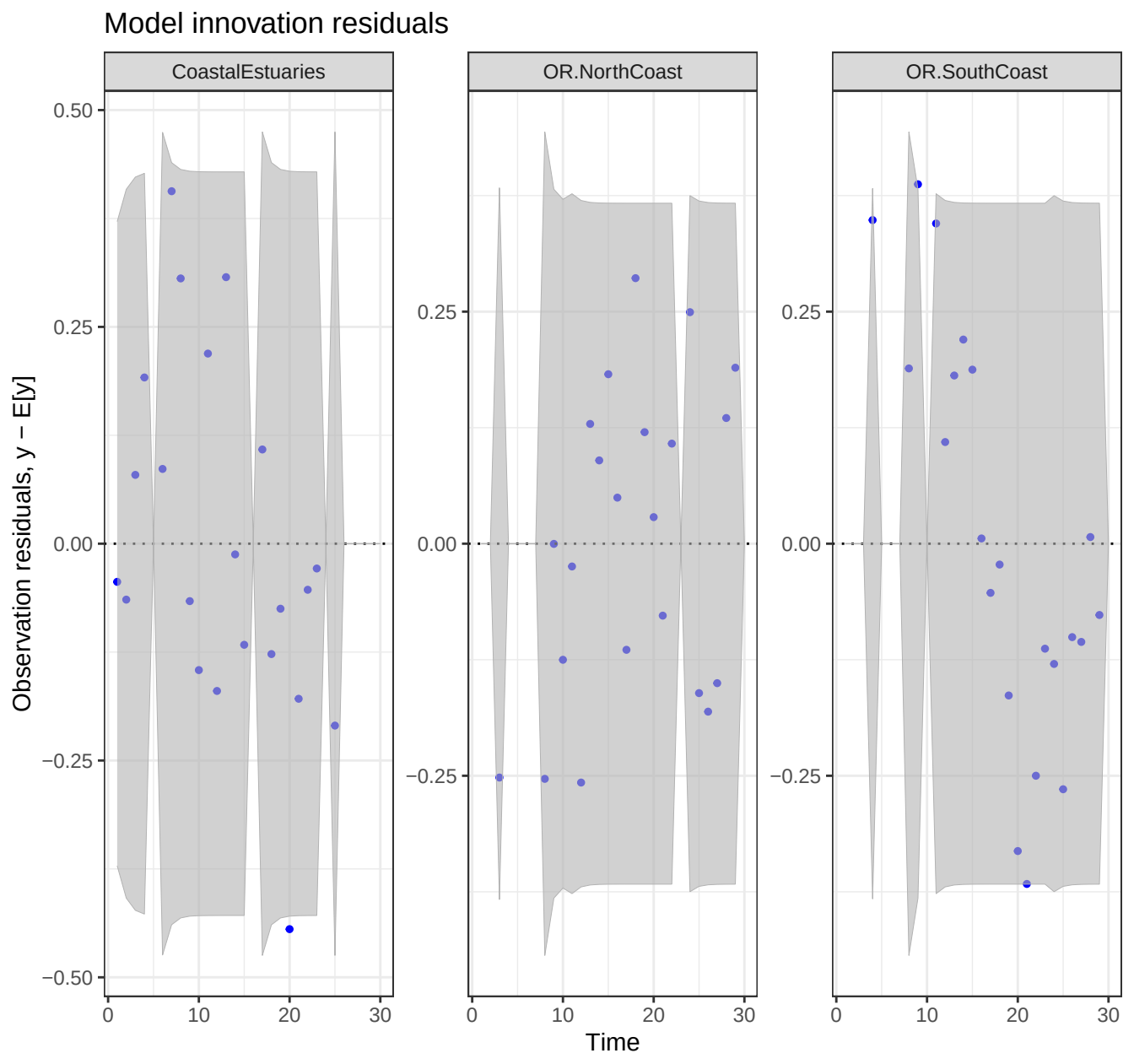

Data Greens
Estimate ytt1
2
1
0
−1
−2
−3
20
40
60
80
100
Data Bluegreens
Estimate ytt1
2
1
0
−1
−2
20
40
60
80
100


Data Greens
Estimate ytT
2
1
0
−1
−2
−3
20
40
60
80
100
Data Bluegreens
Estimate ytT
1
0
−1
−2
20
40
60
80
100

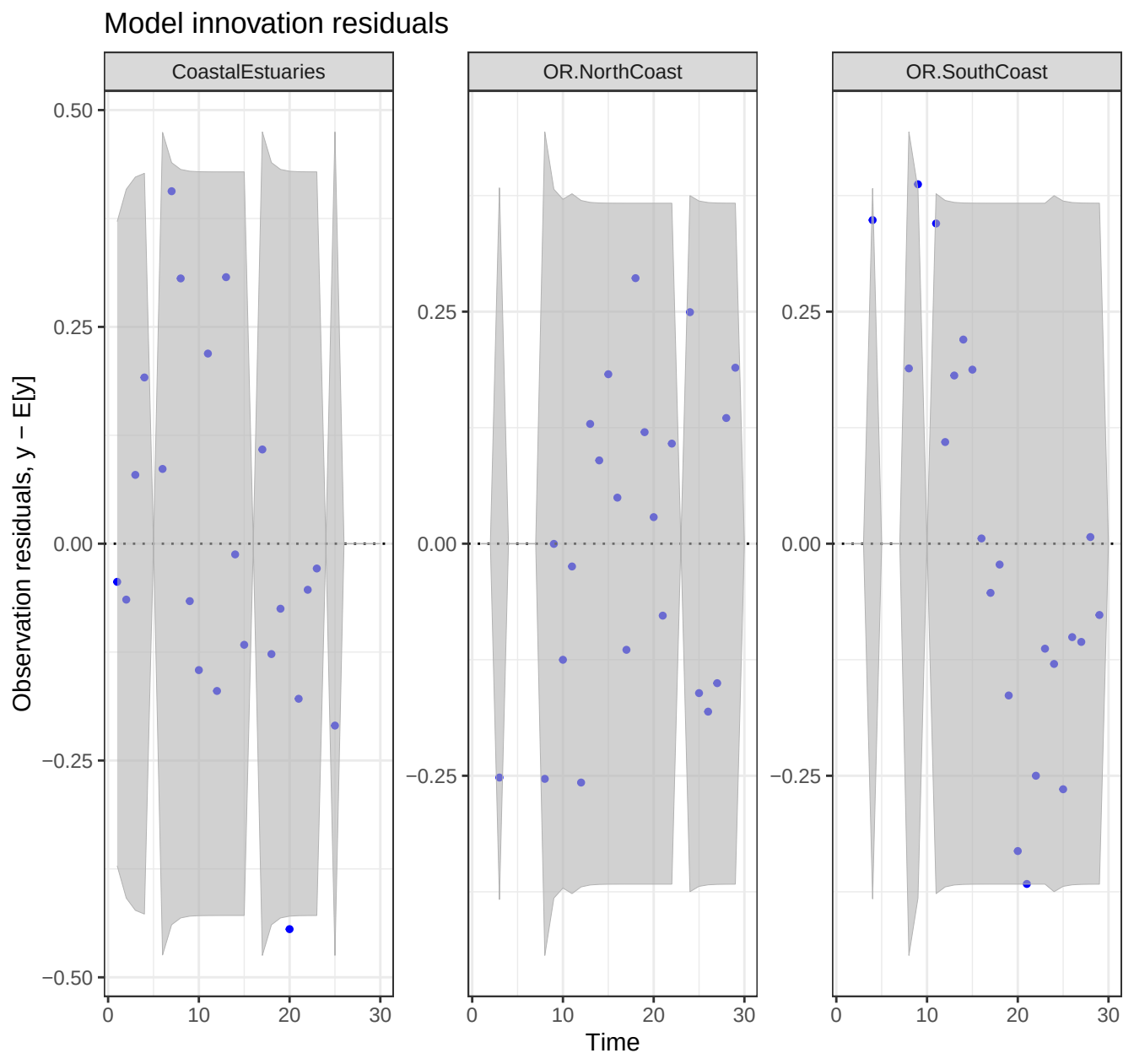

Data Y1
Estimate ytt1
−2
−4
−6
−8
−10
5
10
15
20
Data Y2
Estimate ytt1
2
4
6
8
10
5
10
15
20


Data Greens
Estimate ytt1
2
1
0
−1
−2
−3
−4
20
40
60
80
100
Data Bluegreens
Estimate ytt1
4
3
2
1
0
−1
−2
20
40
60
80
100


Data Greens
Estimate ytt1
1
0
−1
−2
−3
−4
115
120
125
130
Data Bluegreens
Estimate ytt1
4
3
2
1
0
−1
−2
115
120
125
130



Innovations (one−step ahead) residuals.These residuals should not have a temporal trend and 95% of residuals should fall within the CIs. A violation of this indicates that the model cannot fit the data.



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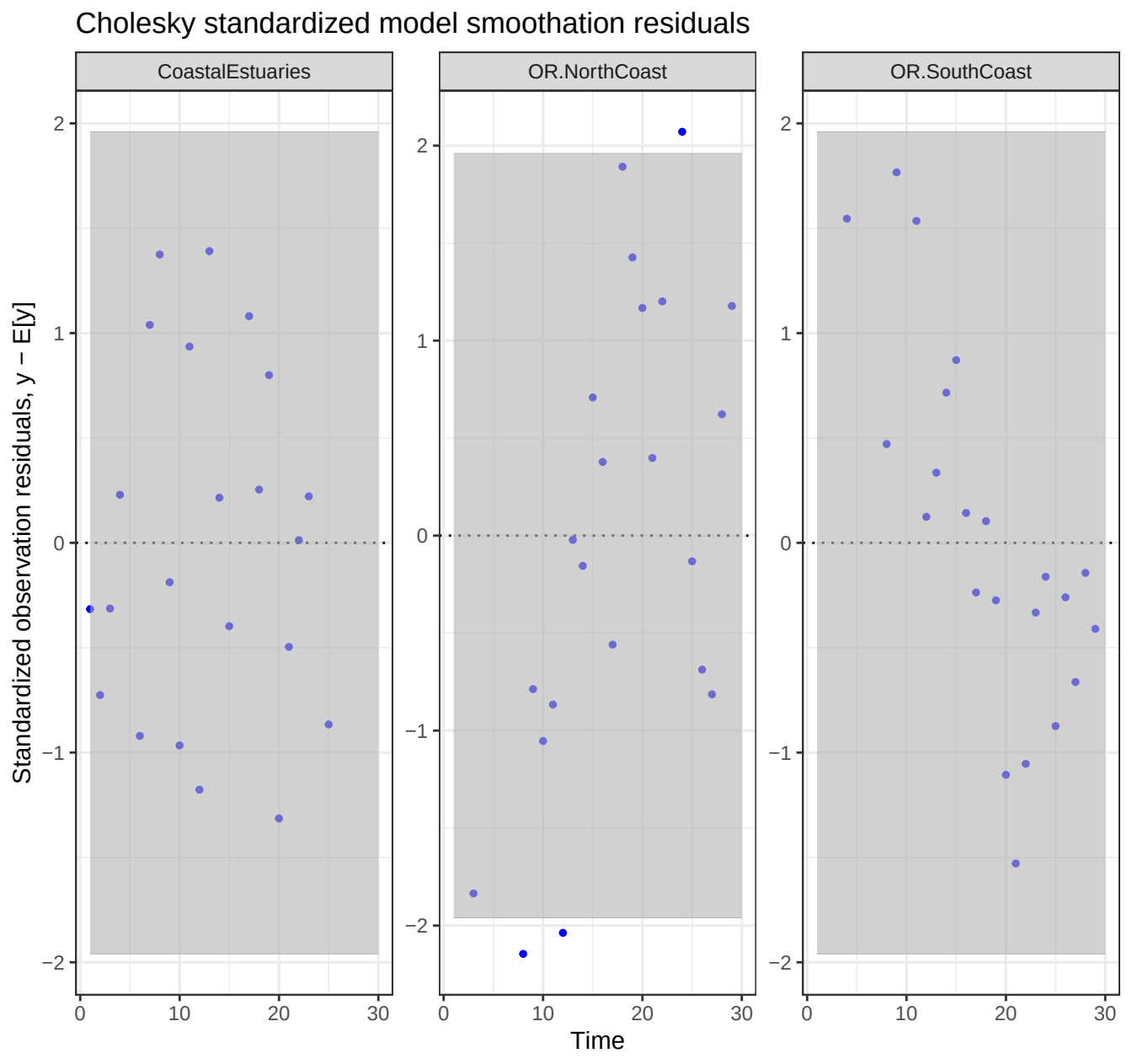
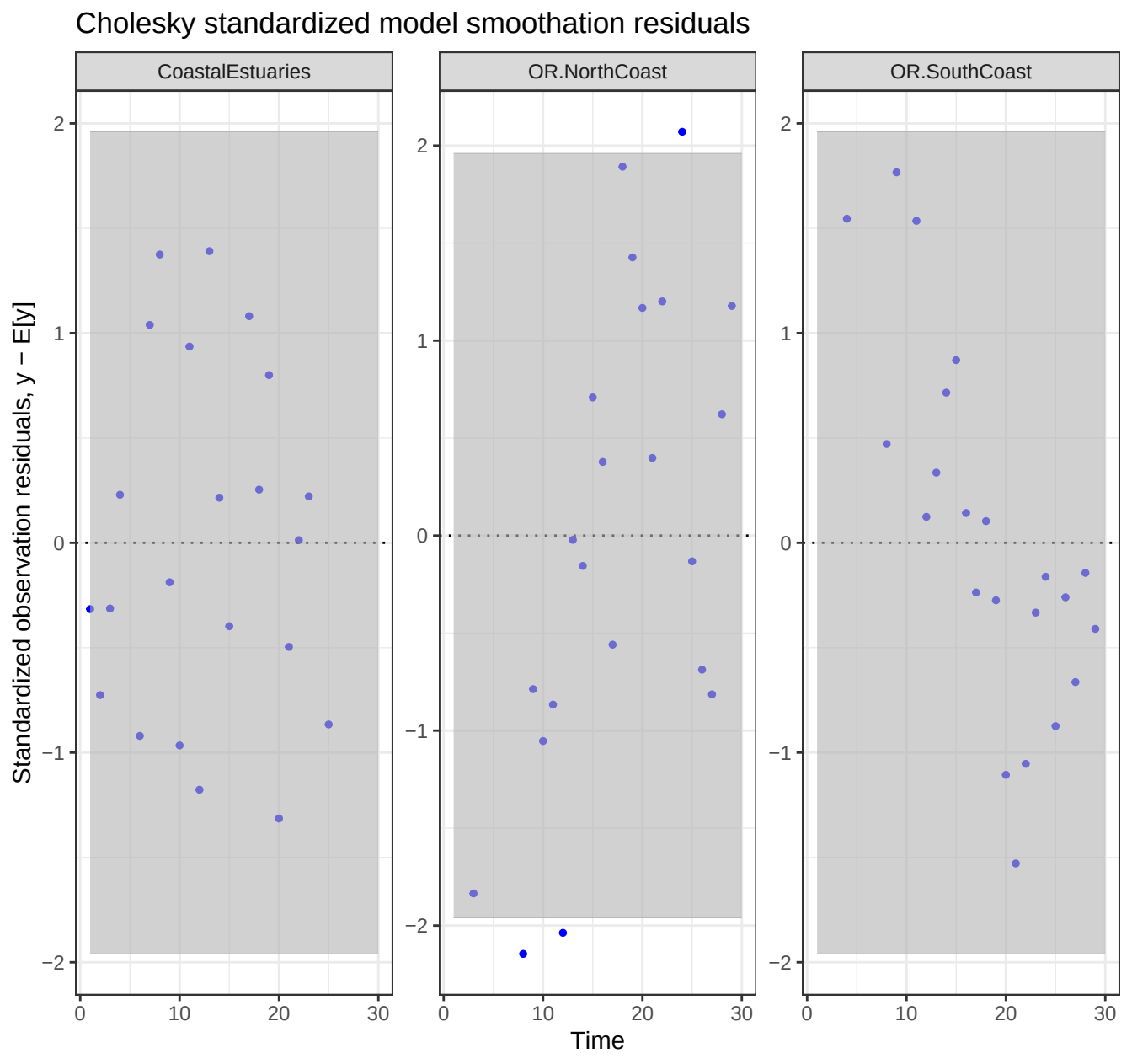


Cholesky standardized model smoothation (ytT) residuals. These residuals should not have a temporal trend. Residuals outside the +/− 2 limits are potential outliers.



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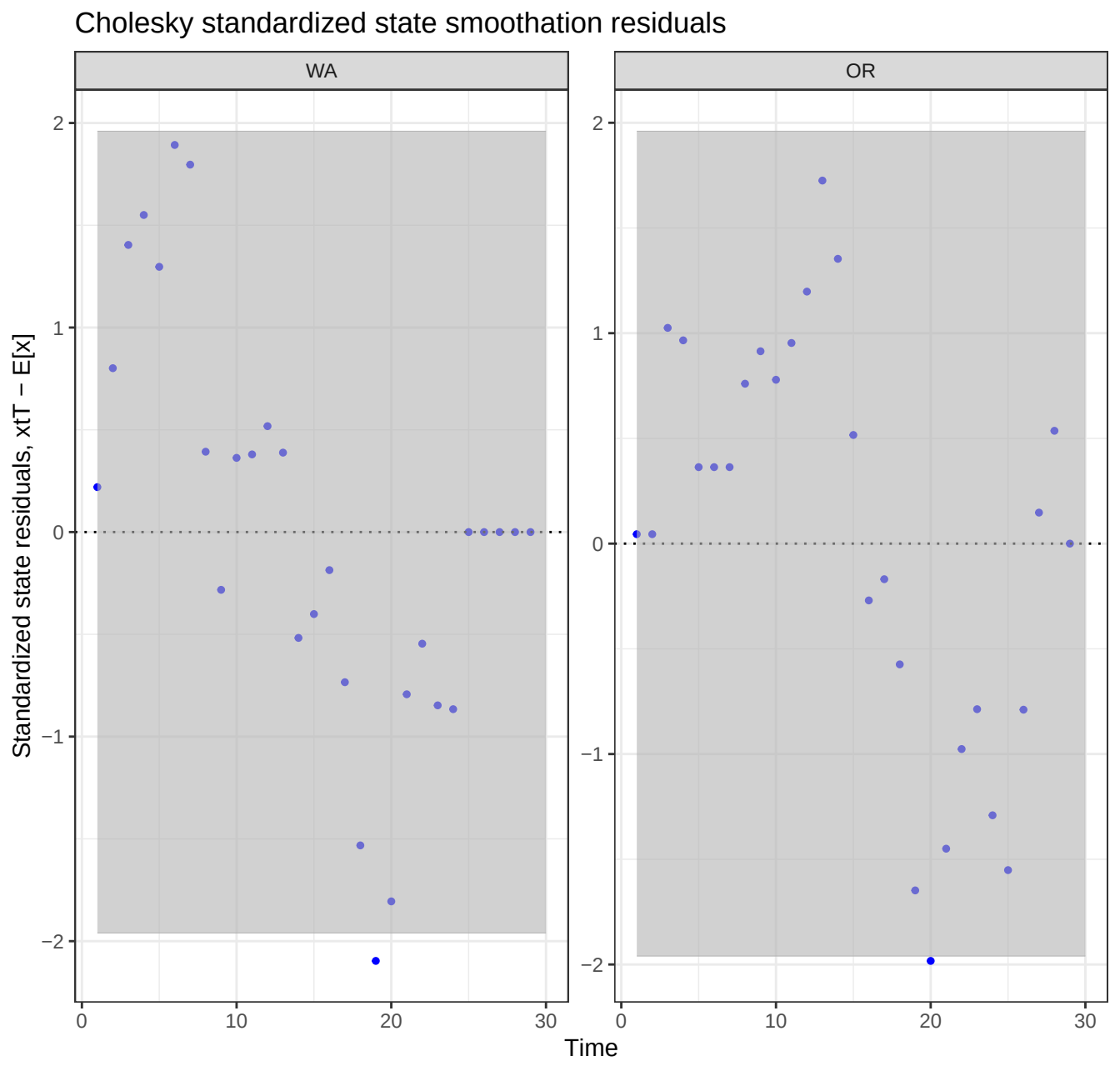
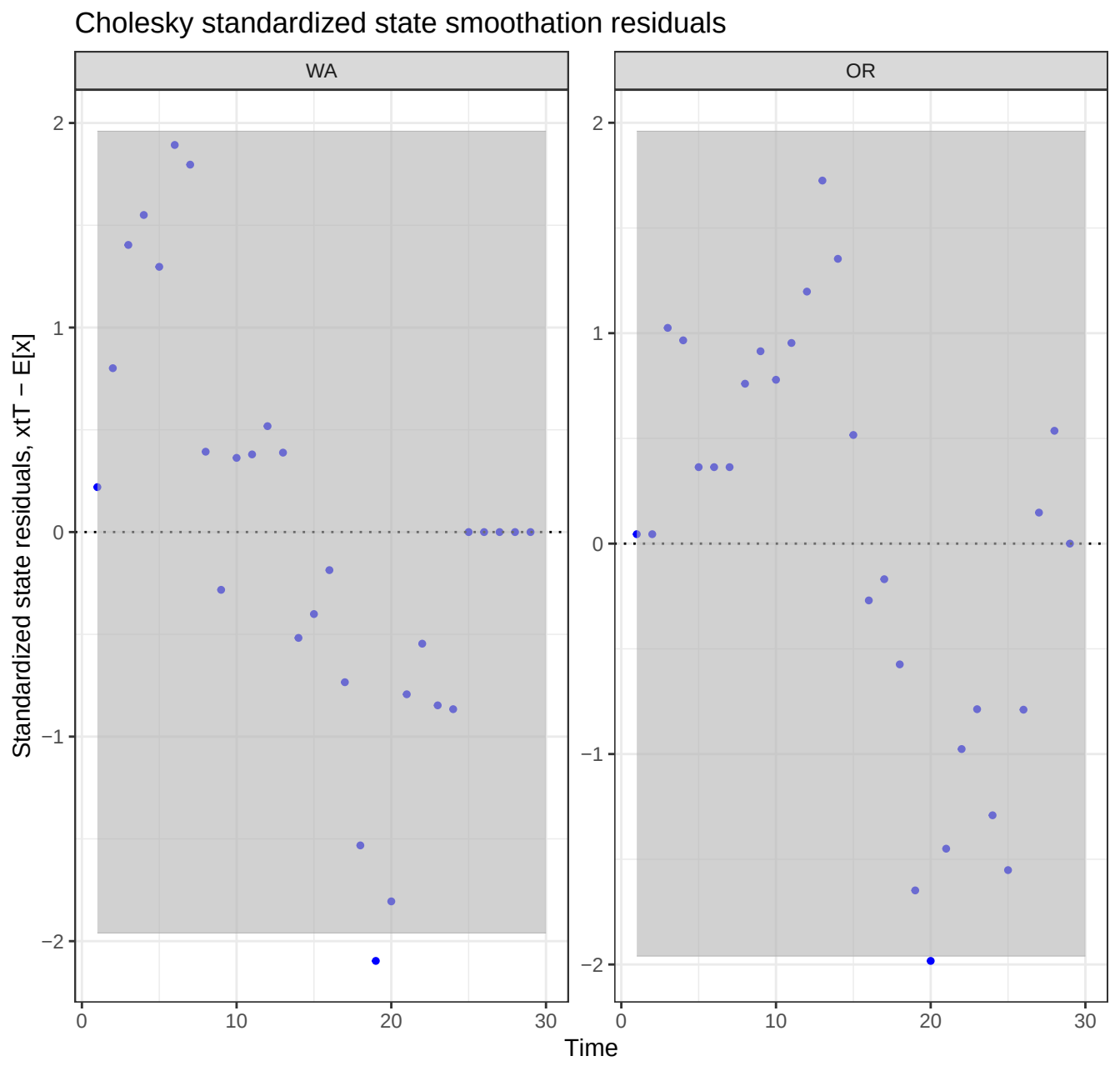


Cholesky standardized state smoothation (xtT) residuals. Residuals outside the +/− 2 limits are potential outliers of x(t) to x(t+1).



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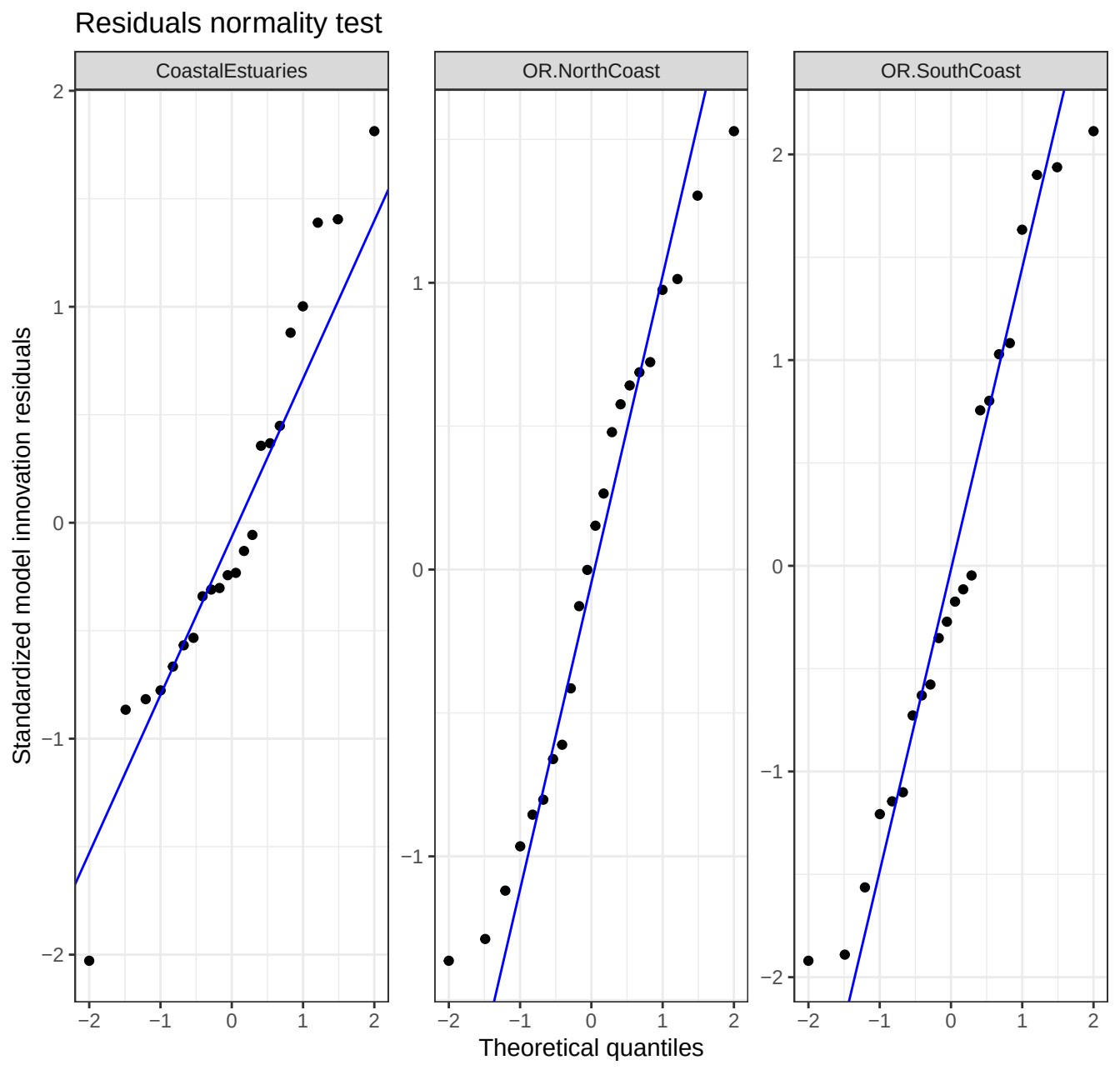
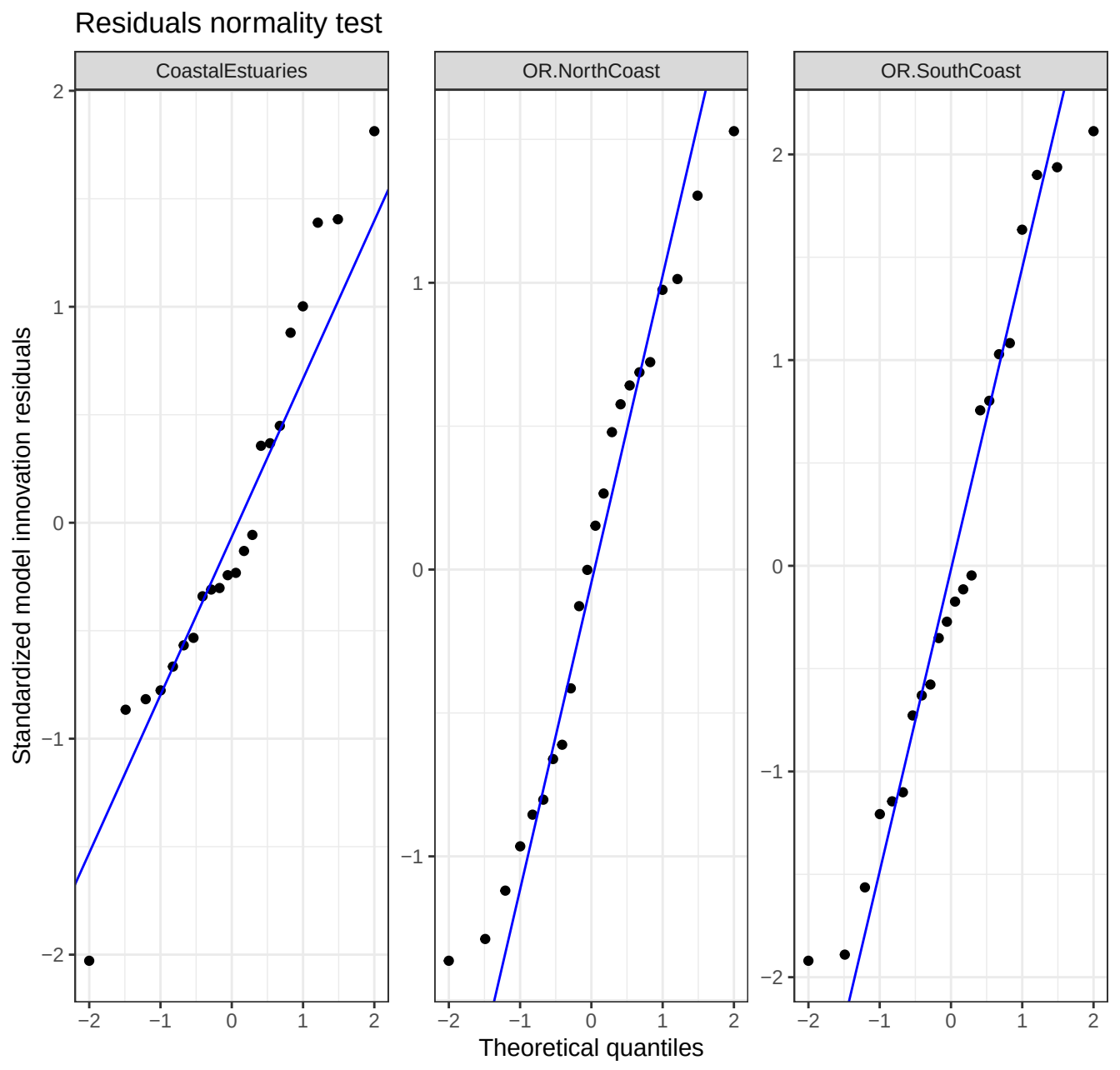


Cholesky standardized model innovation (ytt1) residuals. The residuals should be Gaussian



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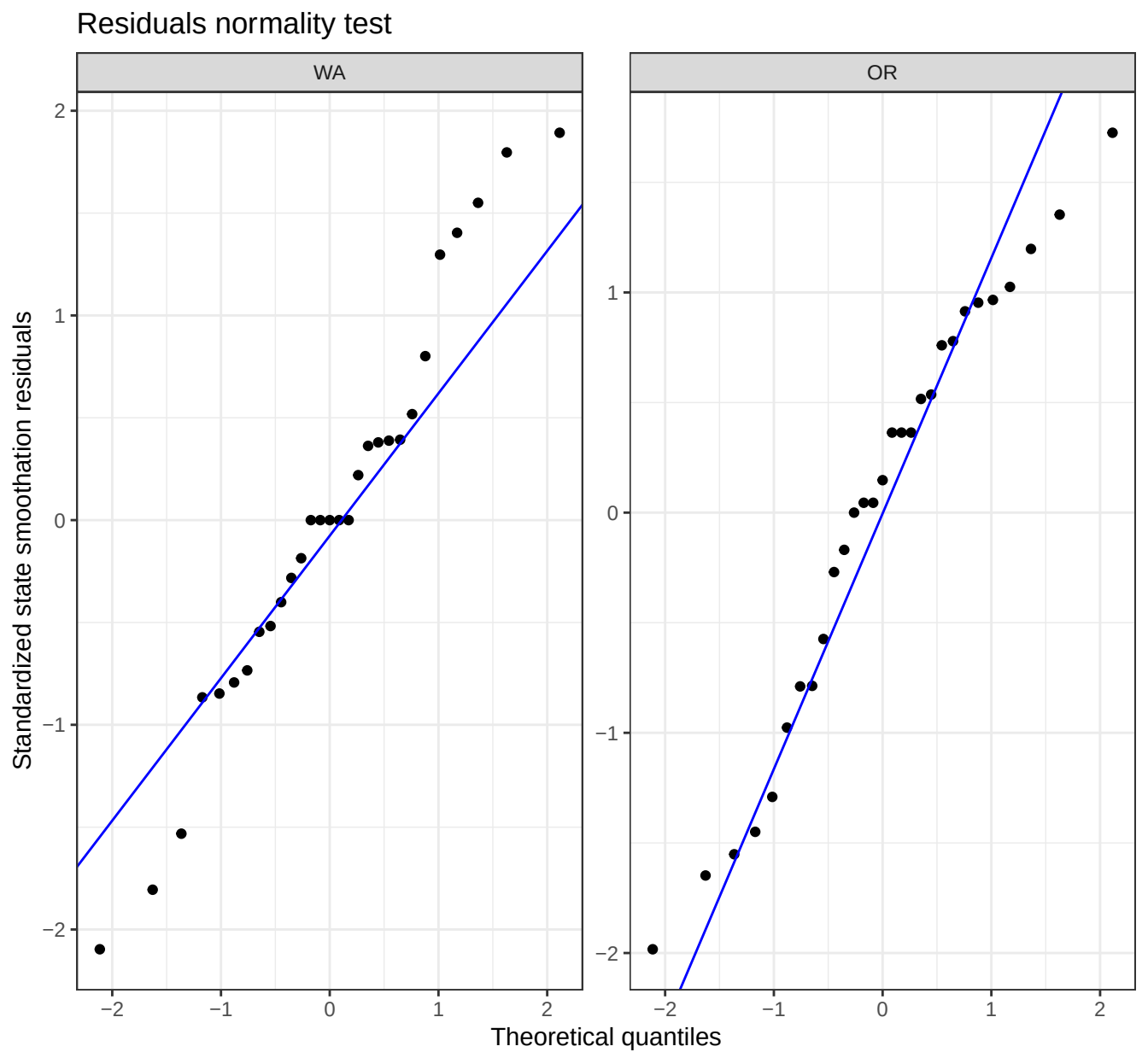
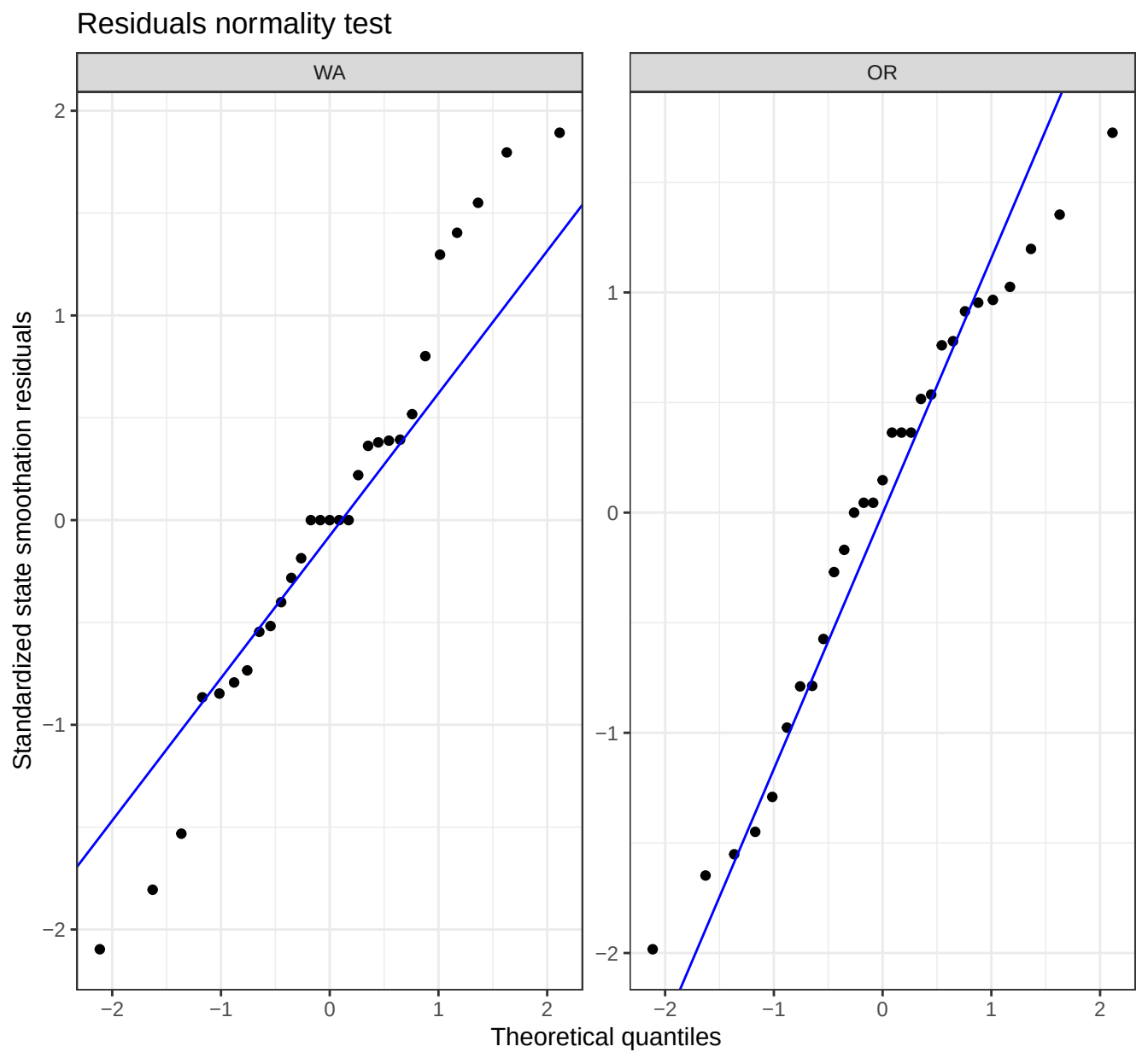


Cholesky standardized state smoothation (xtT) residuals. The residuals should be Gaussian. Note if the data have many missing values, the state residuals will not be Gaussian. In that case, manually remove the states residuals associated with missing data and redo the qq plot.



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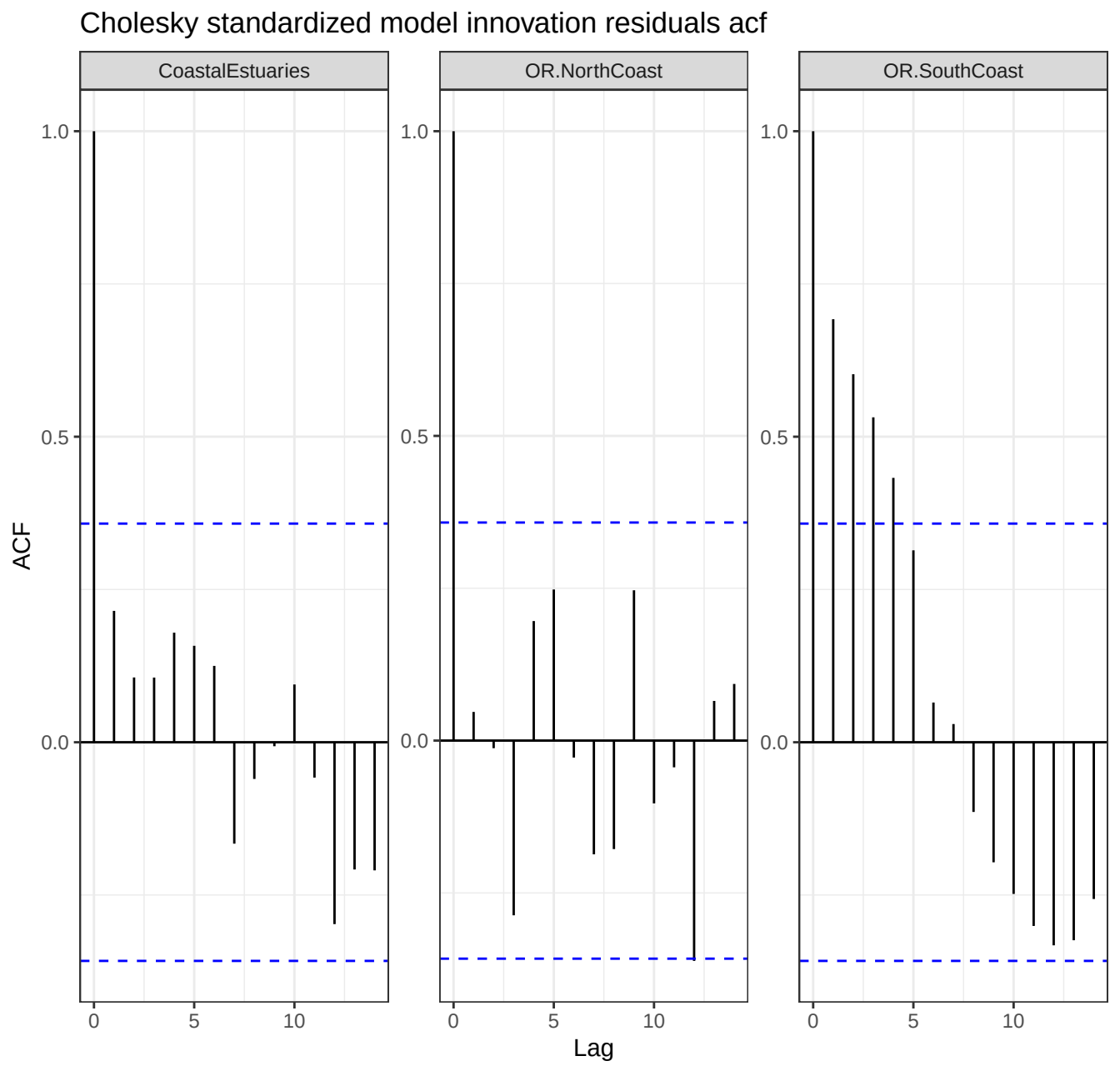
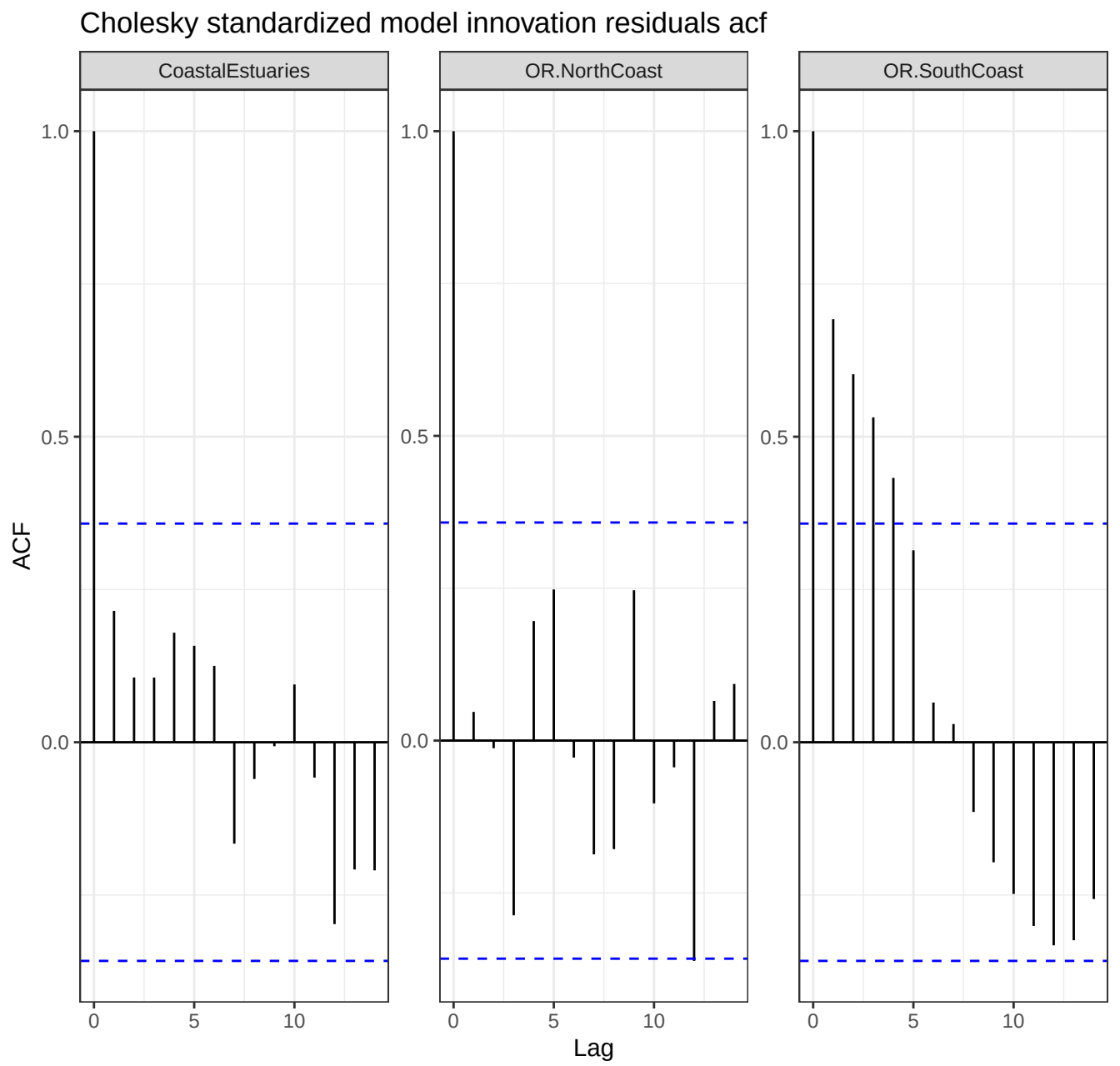


Cholesky standardized model innovation (ytt1) residuals. These residuals should be temporally uncorrelated.



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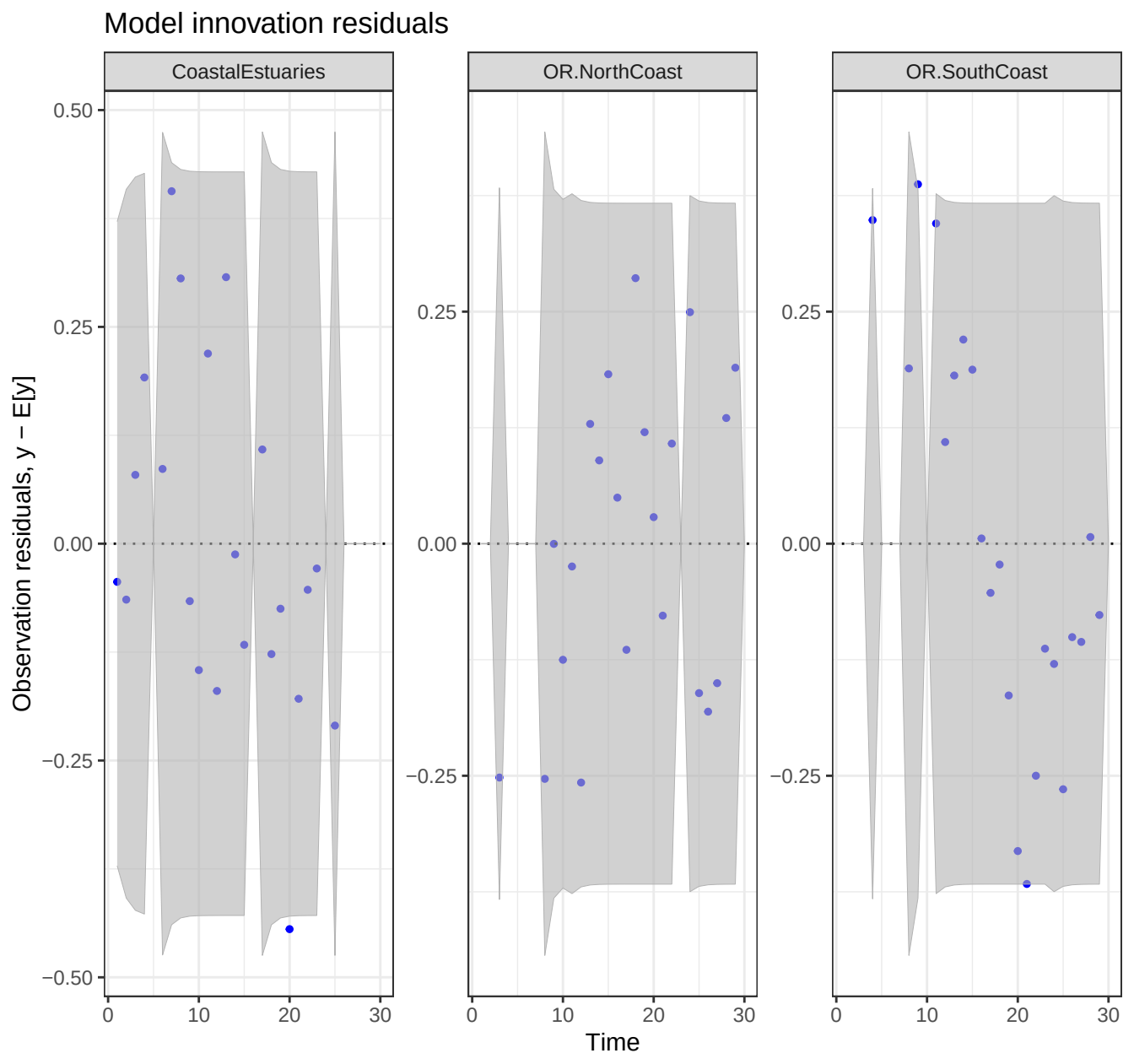

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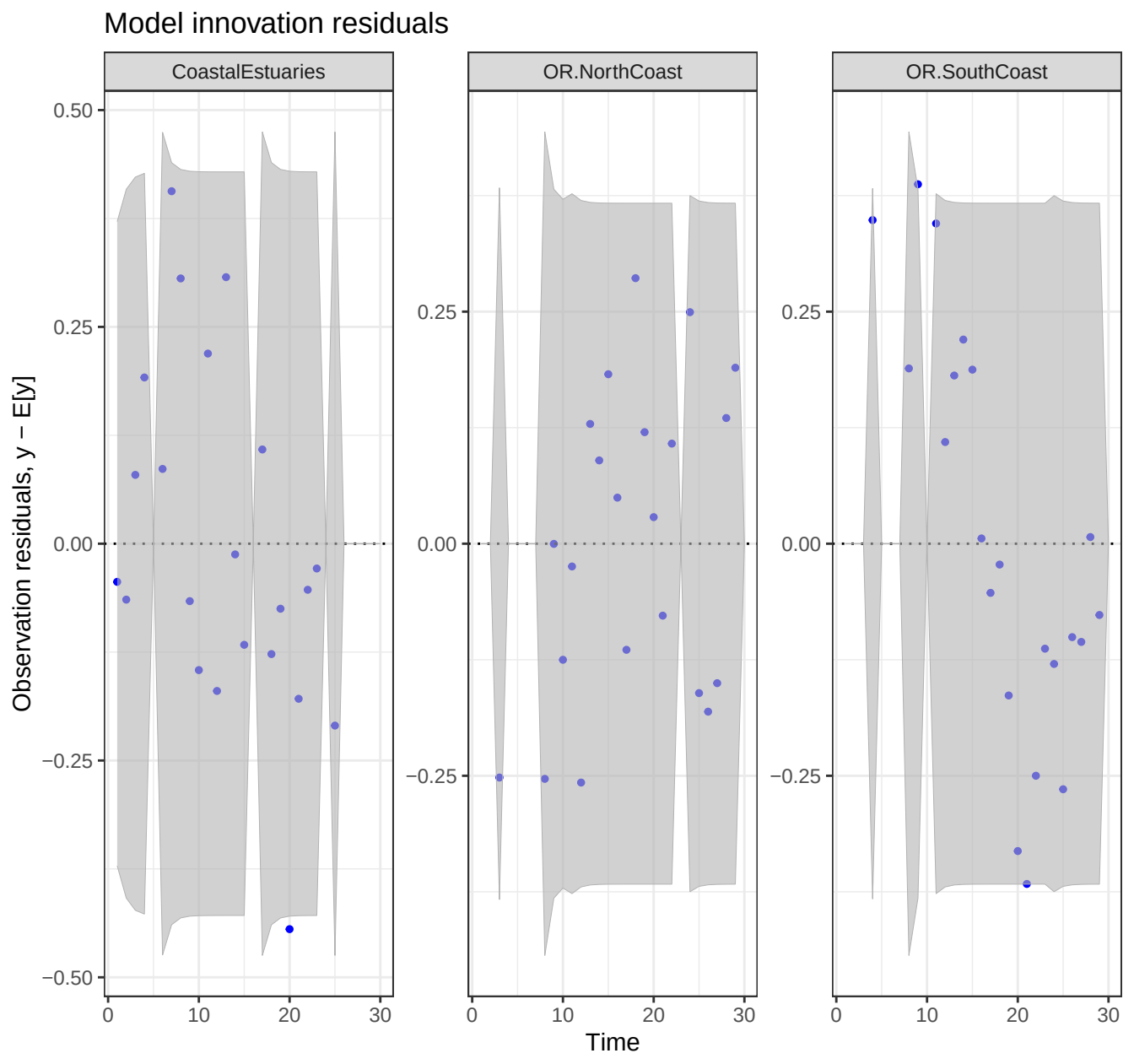

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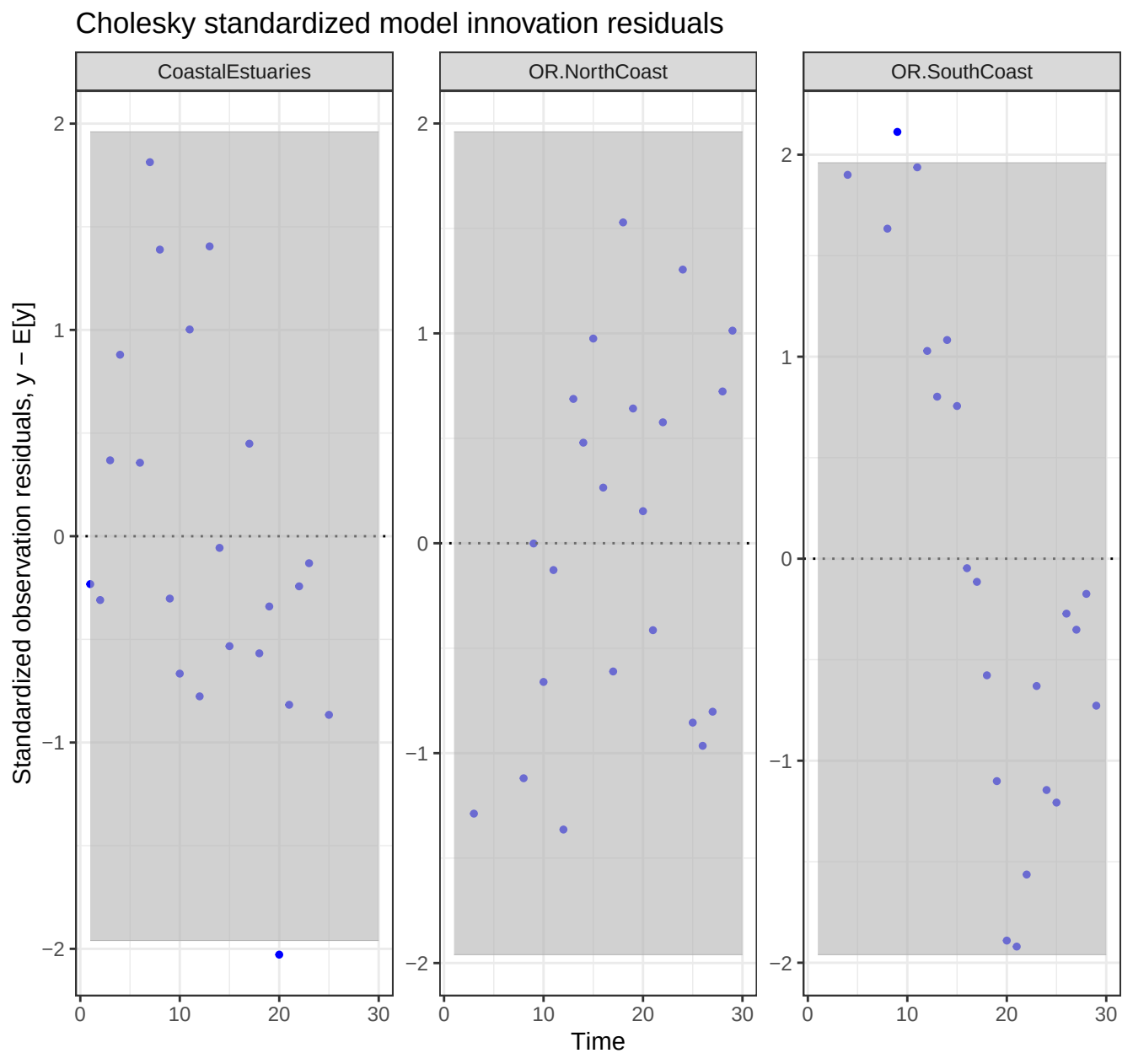
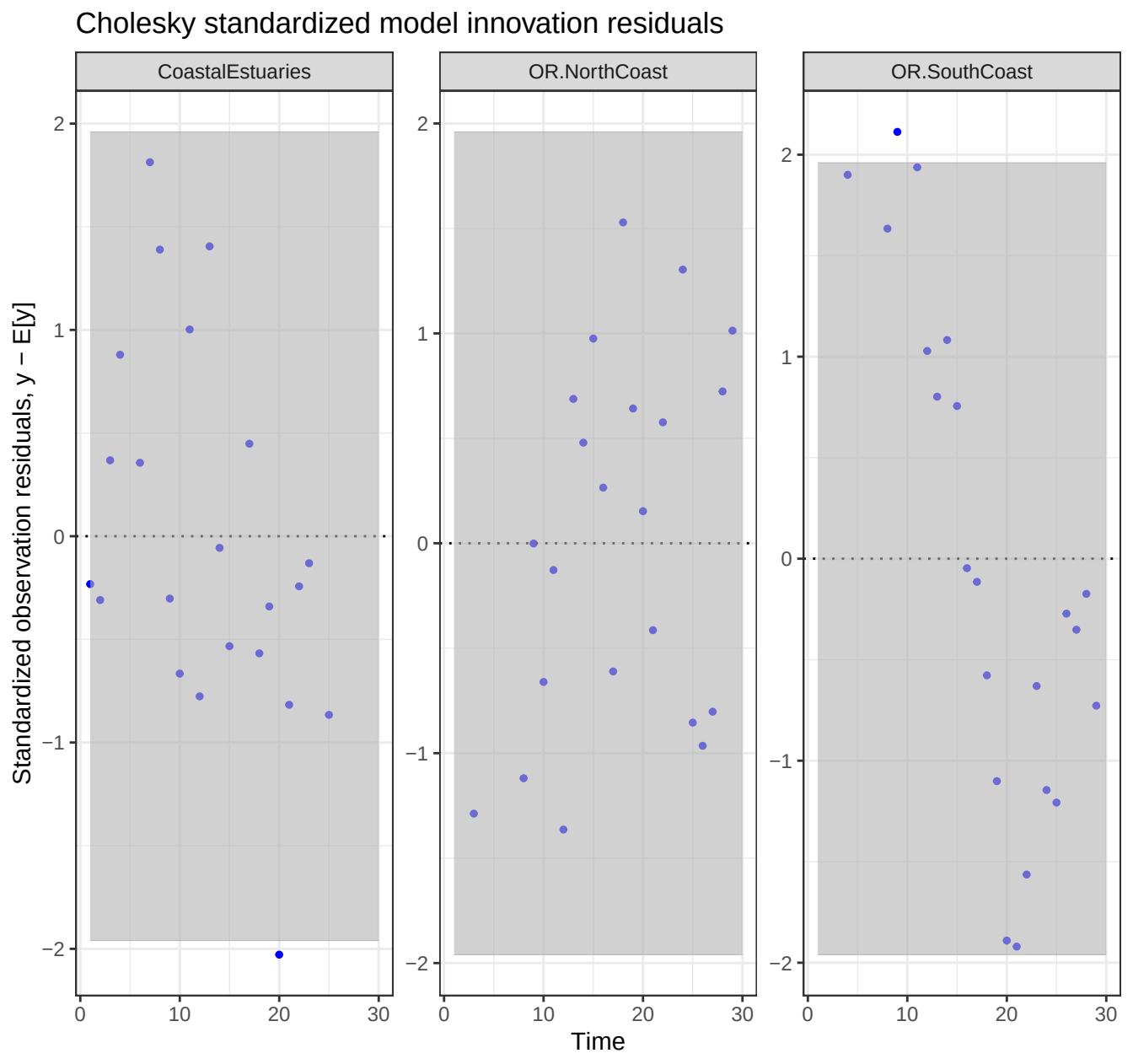


Cholesky standardized innovations residuals. Use standardized model smoothation (ytT) residuals (std.model.resids.ytT) for outlier detection.



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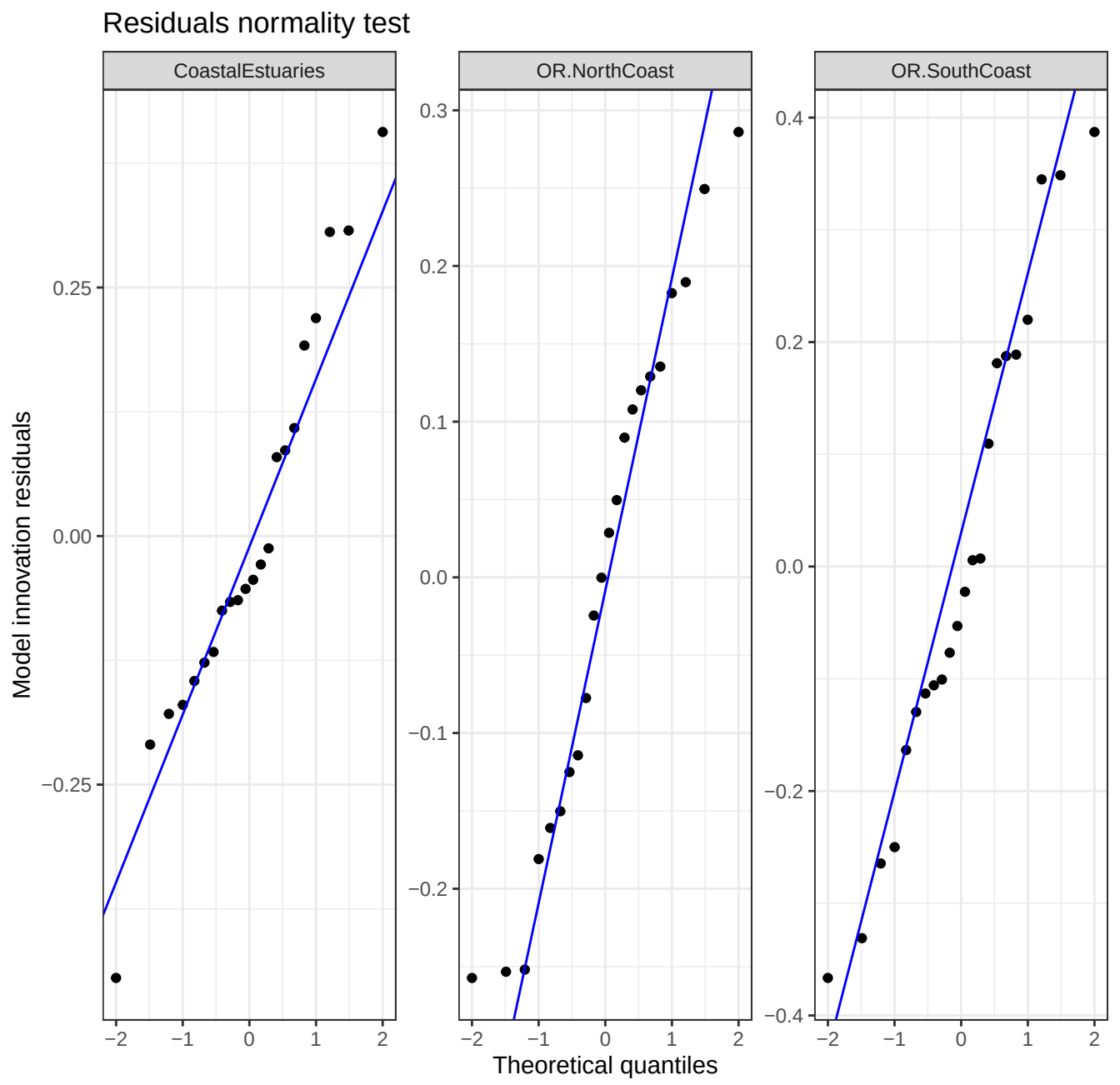
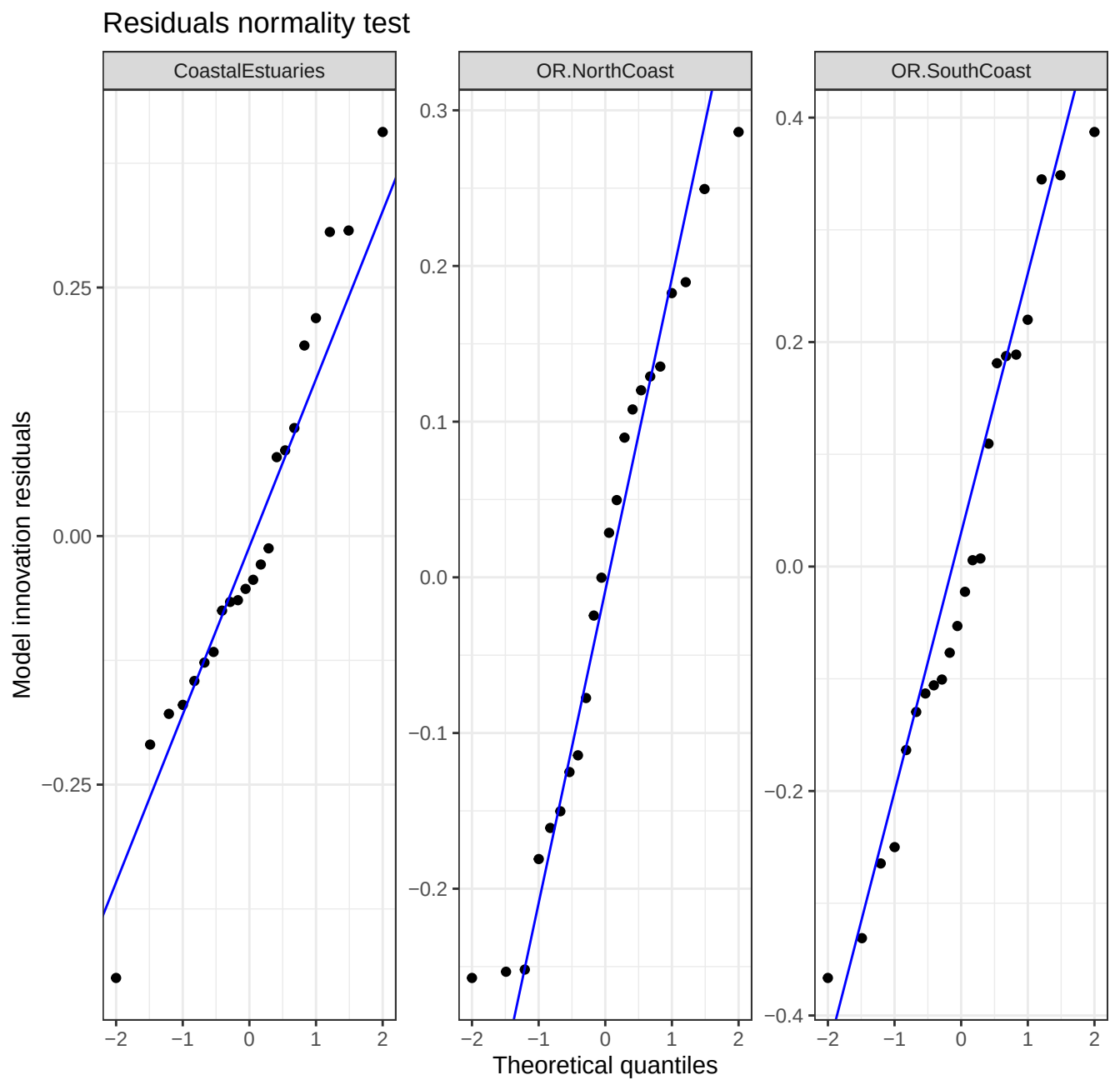


Model innovation (ytt1) residuals. The residuals should be Gaussian



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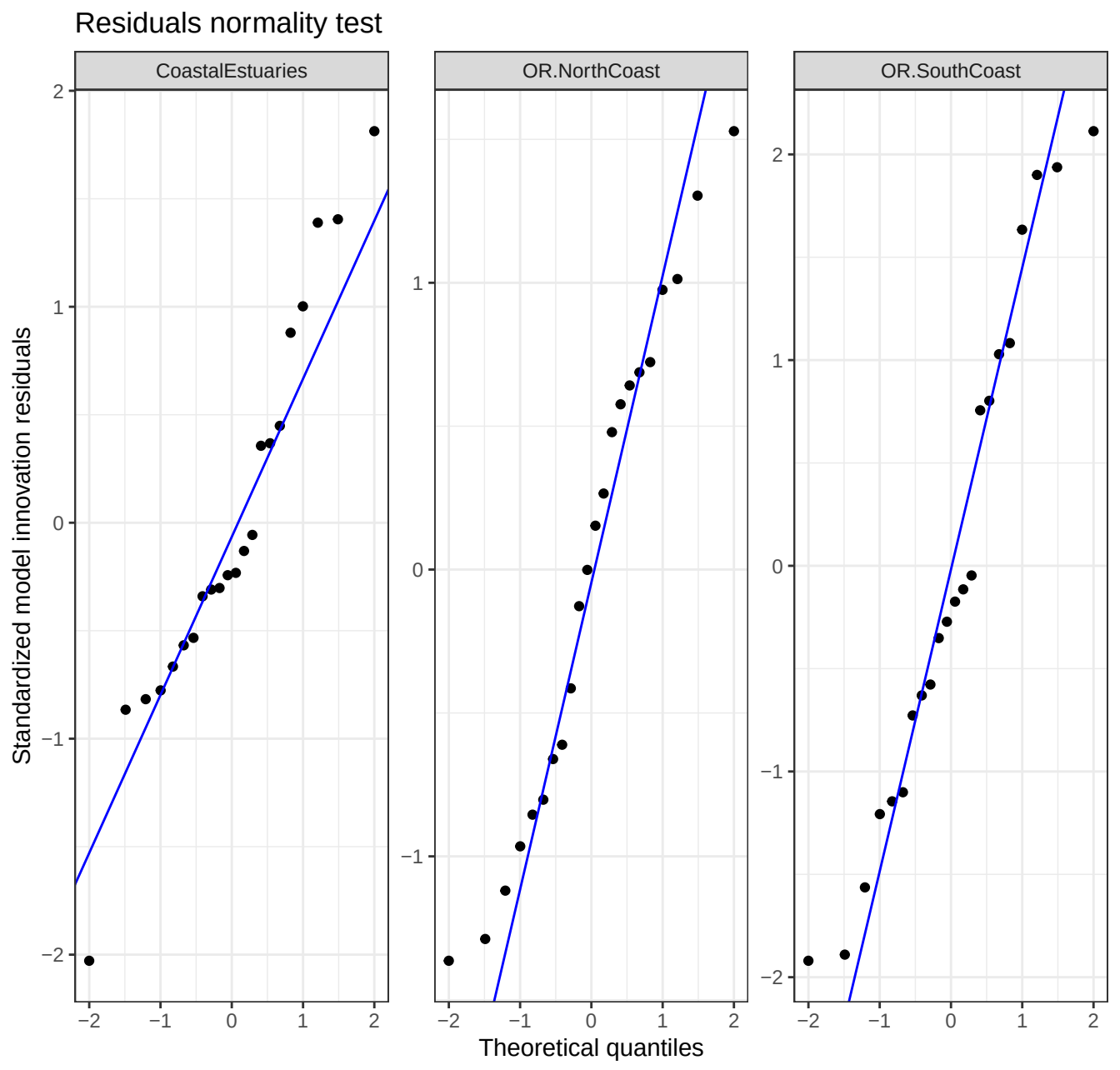
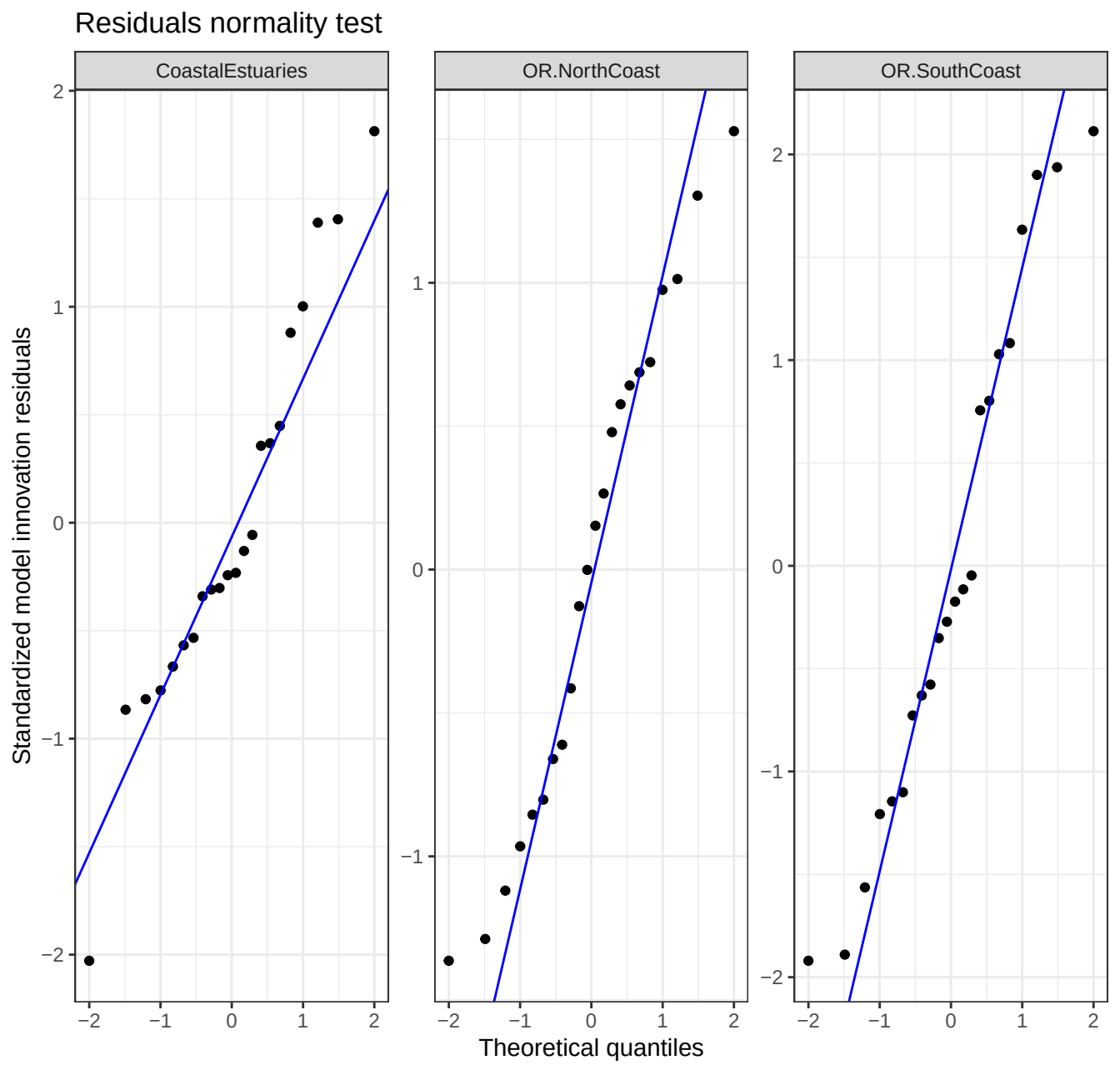
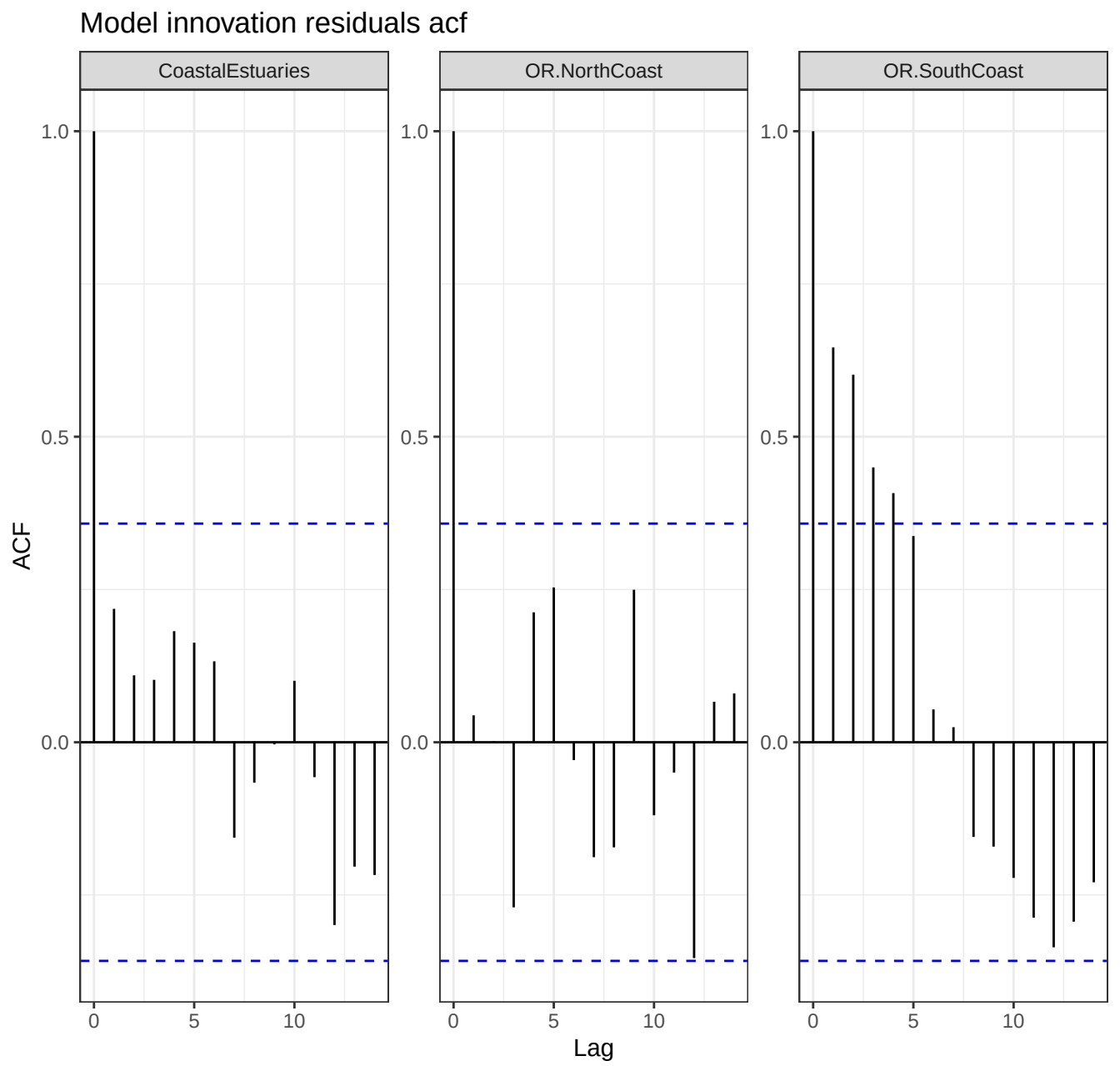


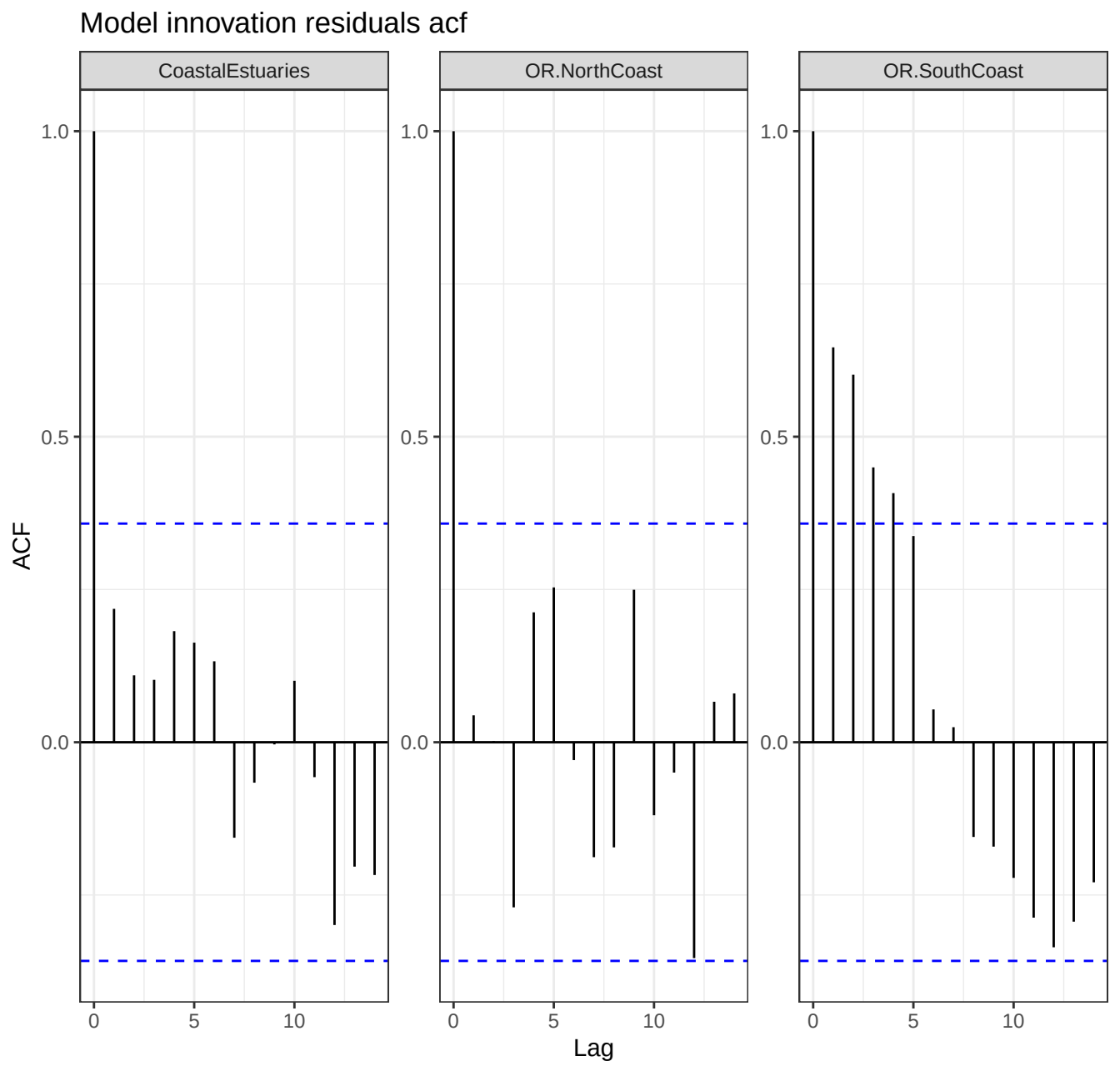
Cholesky standardized model innovation (ytt1) residuals. The residuals should be Gaussian



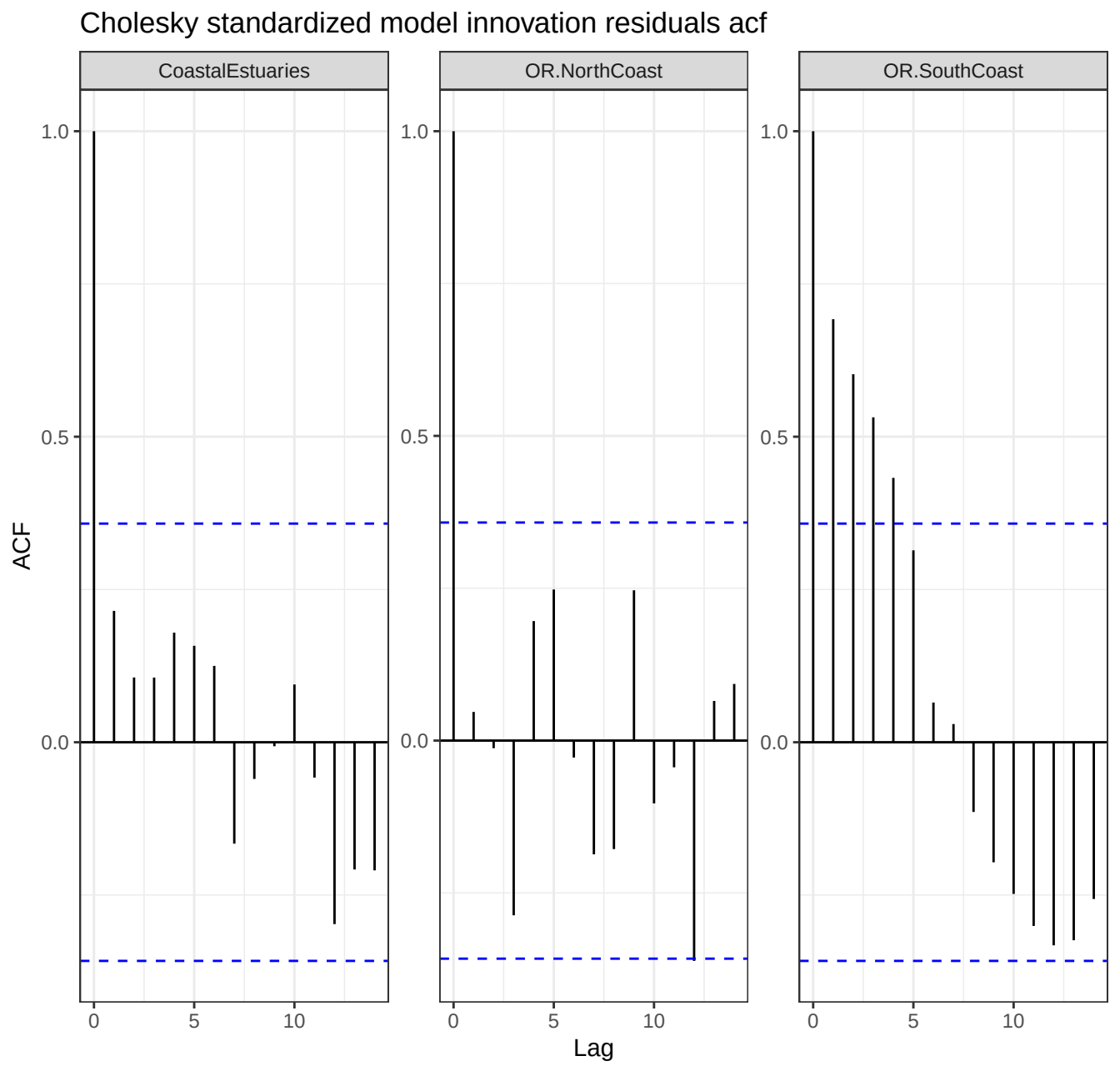
Cholesky standardized model innovation (ytt1) residuals. The residuals should be Gaussian



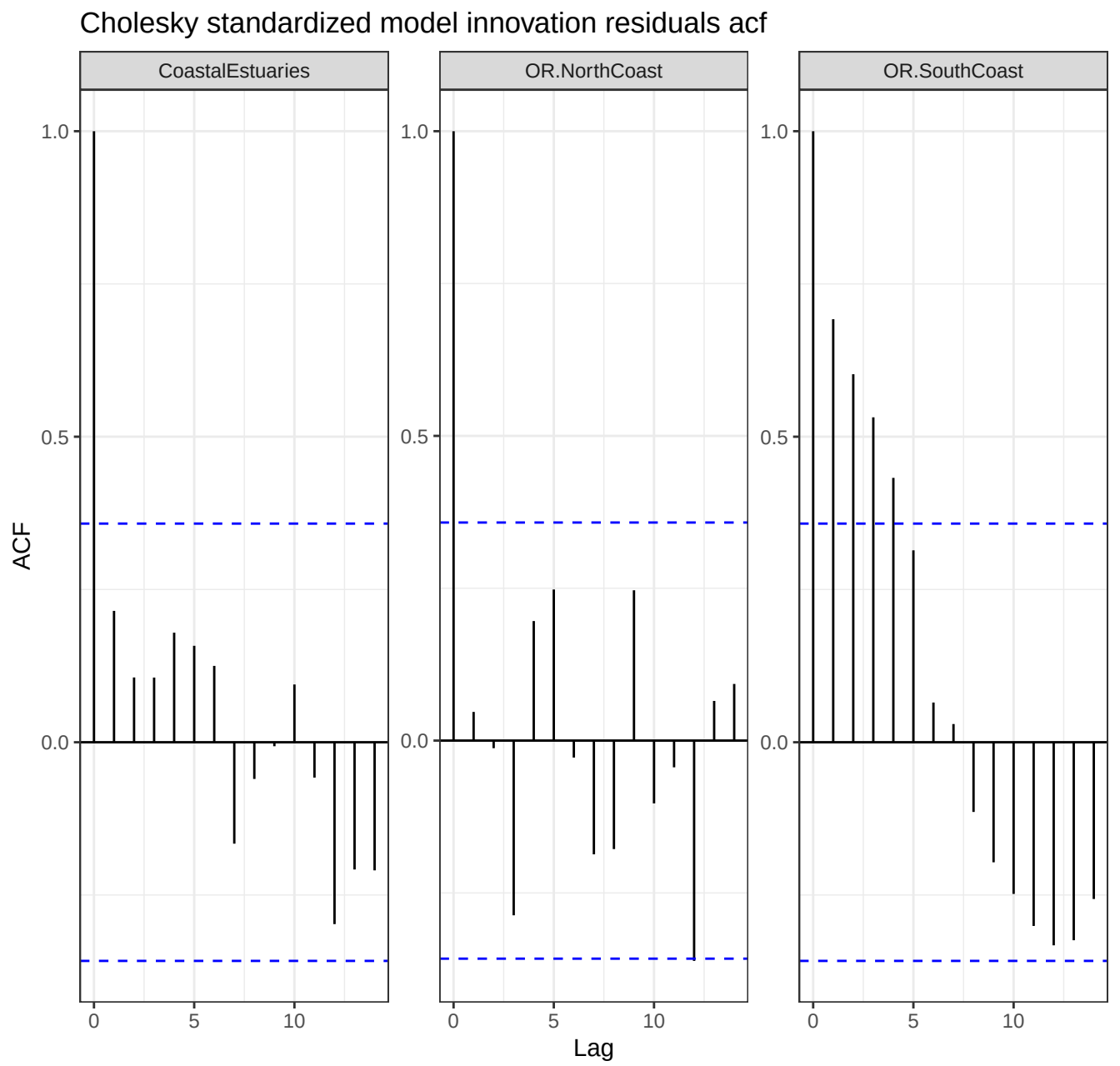
Model innovation (ytt1) residuals. These residuals should be temporally uncorrelated.



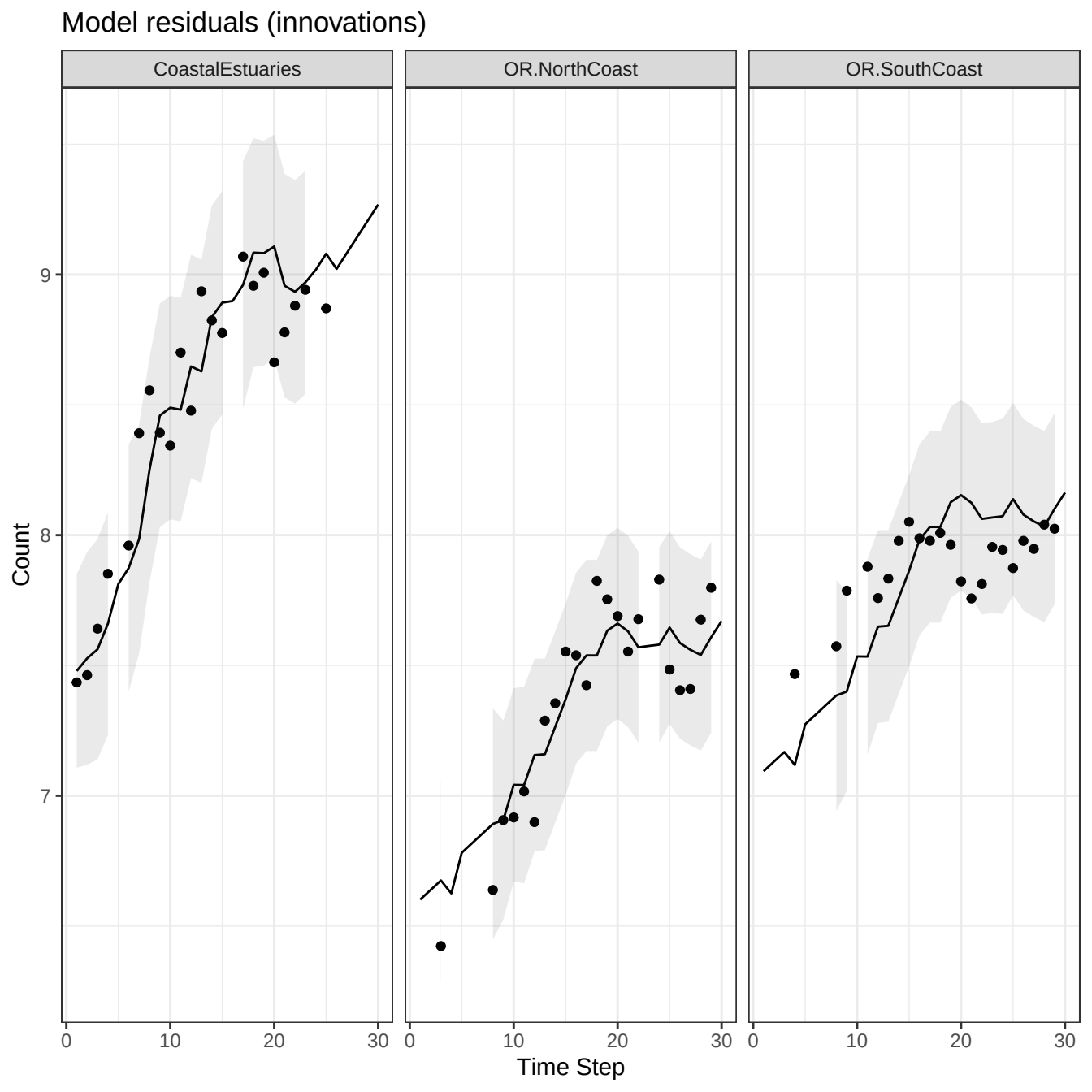
Model innovation (ytt1) residuals. These residuals should be temporally uncorrelated.

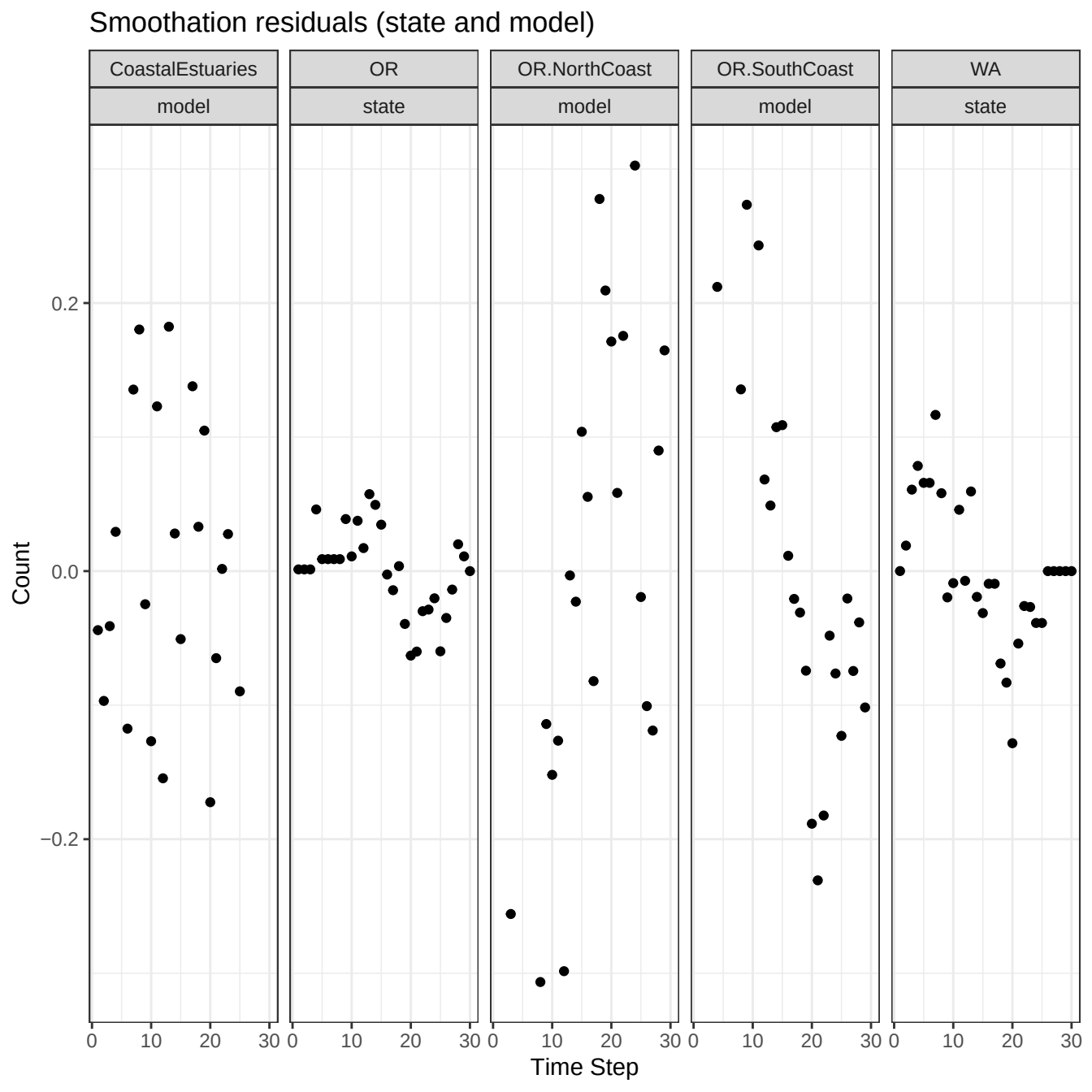


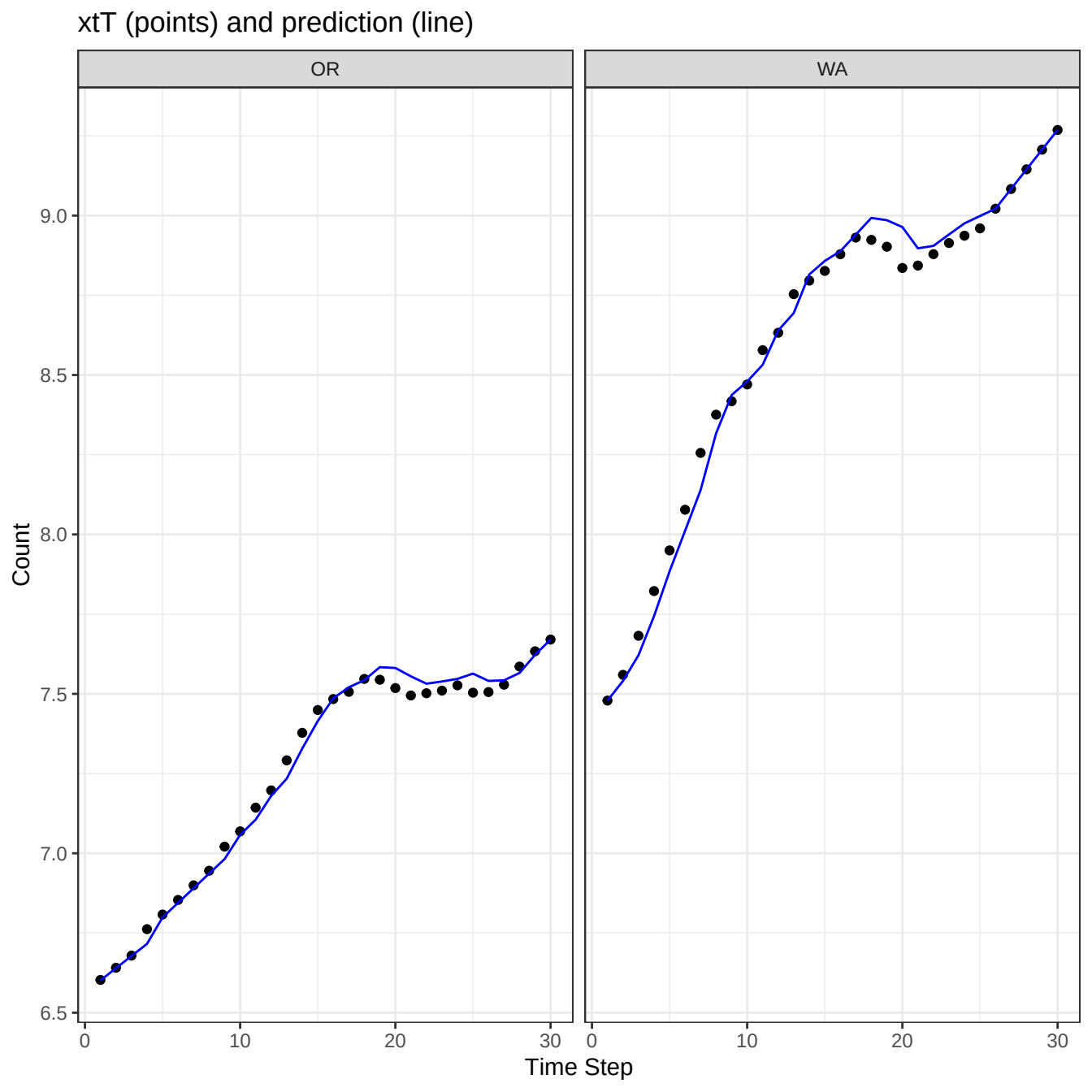
Cholesky standardized model innovation (ytt1) residuals. These residuals should be temporally uncorrelated.

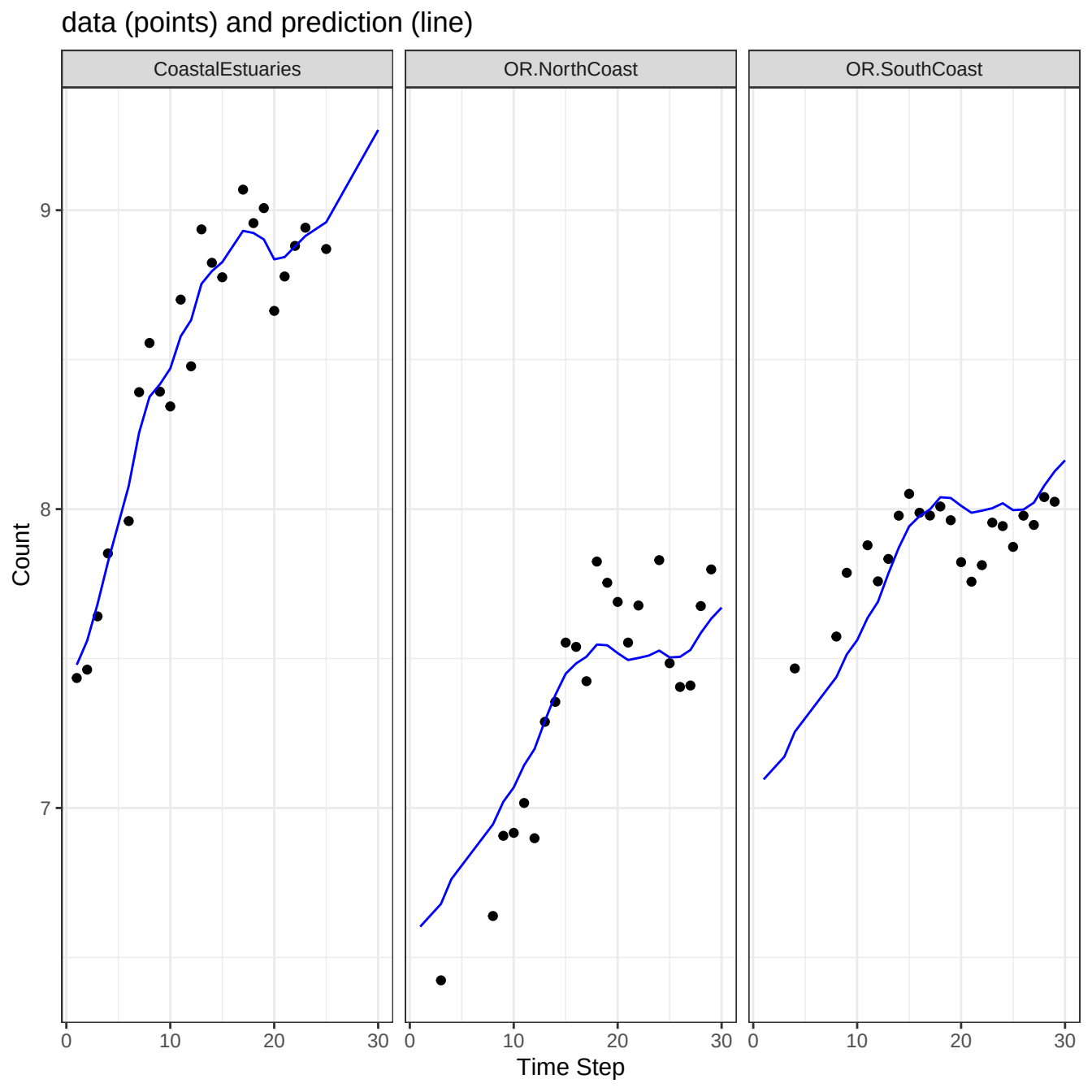


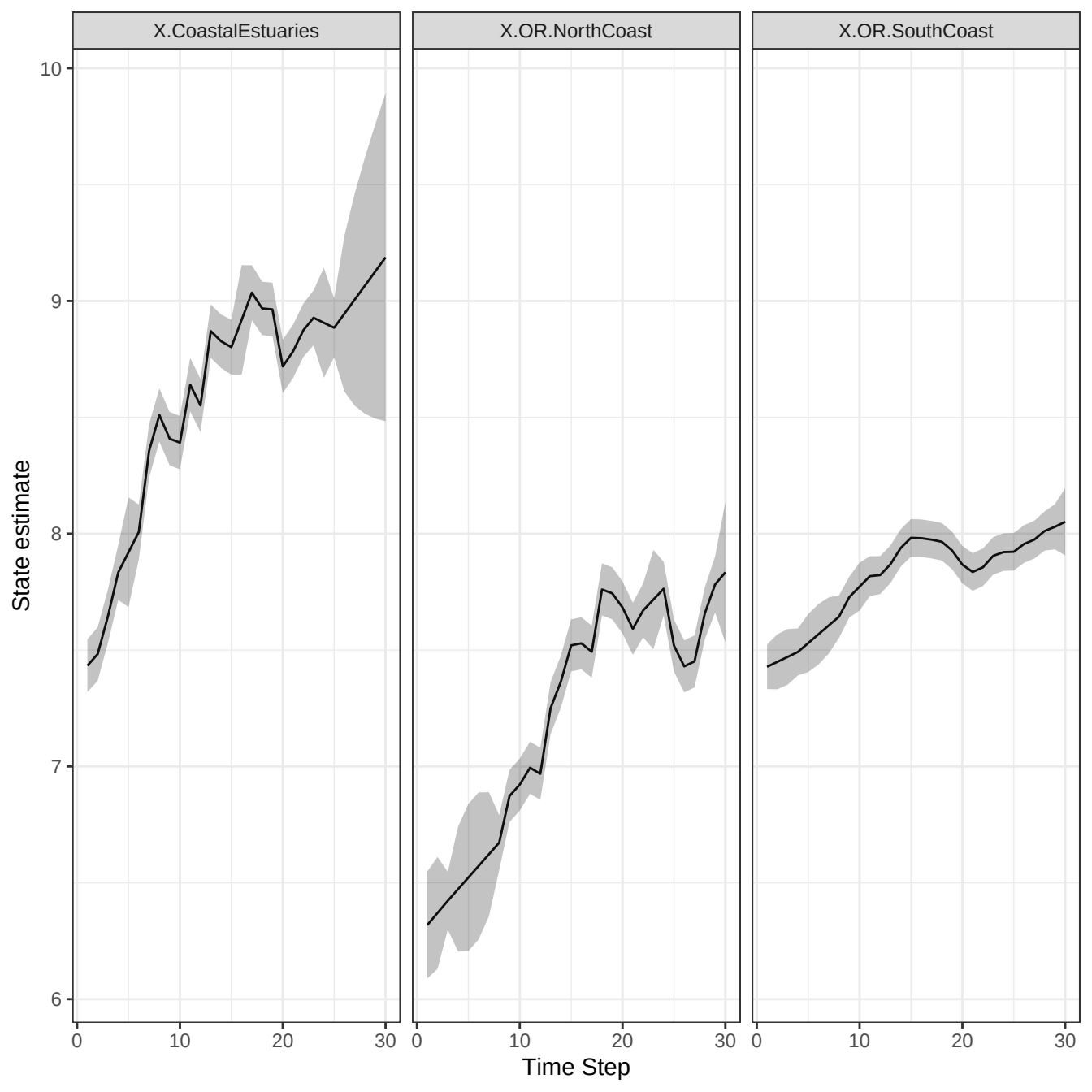
Cholesky standardized model innovation (ytt1) residuals. These residuals should be temporally uncorrelated.

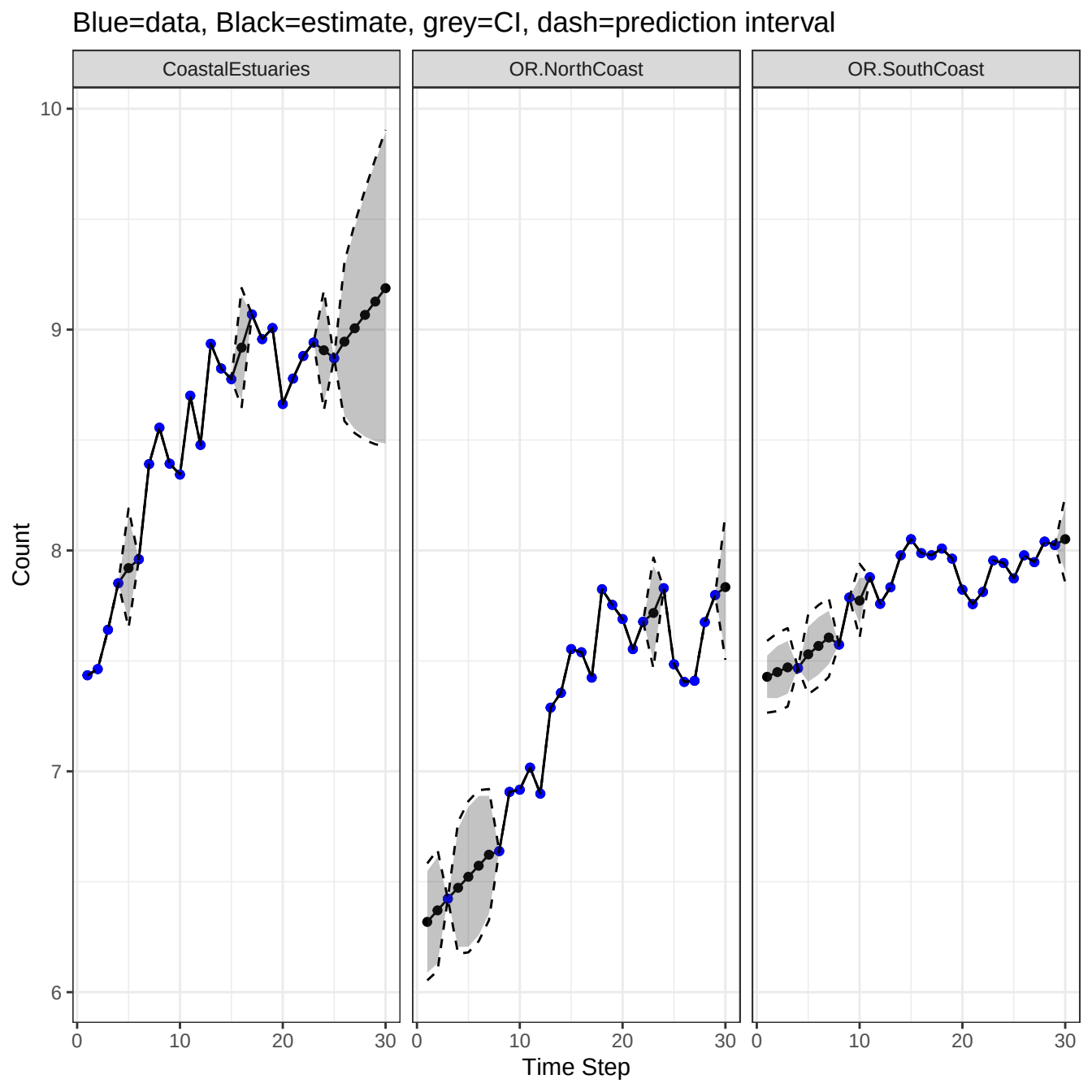

Model residuals (innovations)
CoastalEstuaries
OR.NorthCoast
OR.SouthCoast
Count
9
8
7
0
10
20
30
Time Step

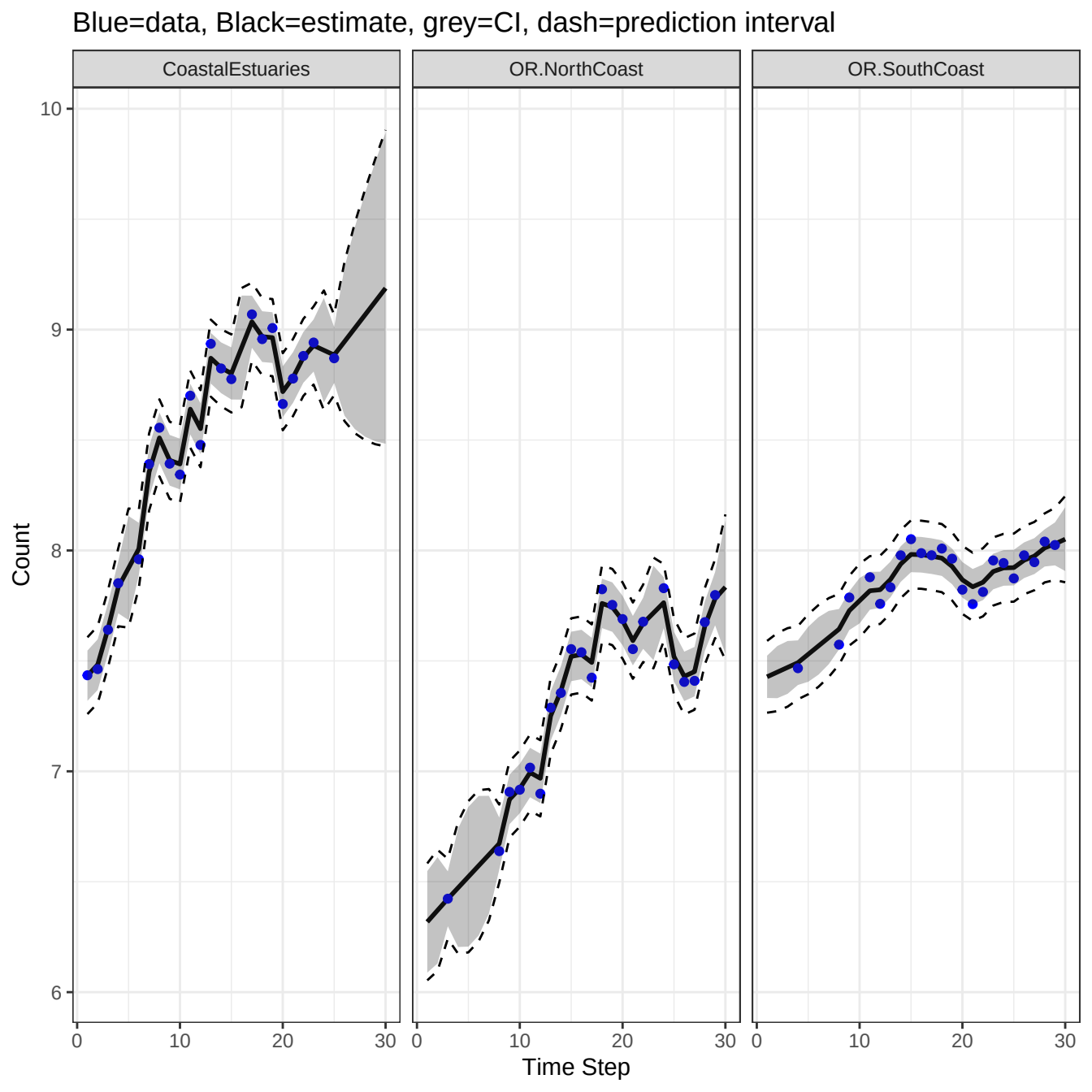

Smoothation residuals (state and model)
CoastalEstuaries
model
OR
state
OR.NorthCoast
model
OR.SouthCoast
model
WA
state
0.2
0.0
−0.2
Count
0
10
20
30
Time Step


xtT (points) and prediction (line)
OR
WA
Count
9.0
8.5
8.0
7.5
7.0
6.5
0
10
20
30
Time Step


data (points) and prediction (line)
CoastalEstuaries
OR.NorthCoast
OR.SouthCoast
Count
9
8
7
0
10
20
30
Time Step


X.CoastalEstuaries
X.OR.NorthCoast
X.OR.SouthCoast
State estimate
Time Step
10
9
8
7
6
0
10
20
30


Blue=data, Black=estimate, grey=CI, dash=prediction interval
CoastalEstuaries
OR.NorthCoast
OR.SouthCoast
Count
10
9
8
7
6
0
10
20
30
Time Step


Blue=data, Black=estimate, grey=CI, dash=prediction interval
CoastalEstuaries
OR.NorthCoast
OR.SouthCoast
Count
Time Step
10
9
8
7
6
0
10
20
30