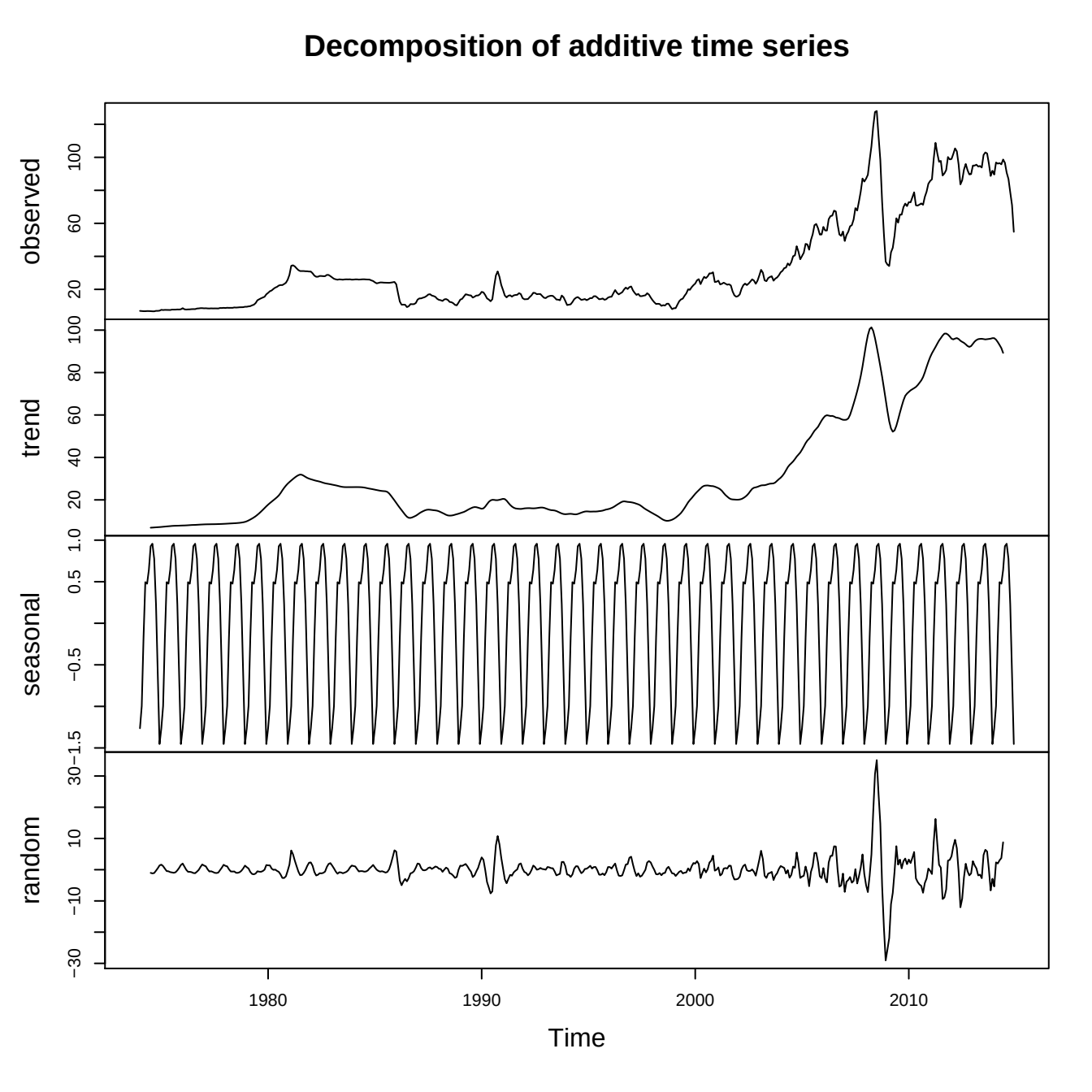
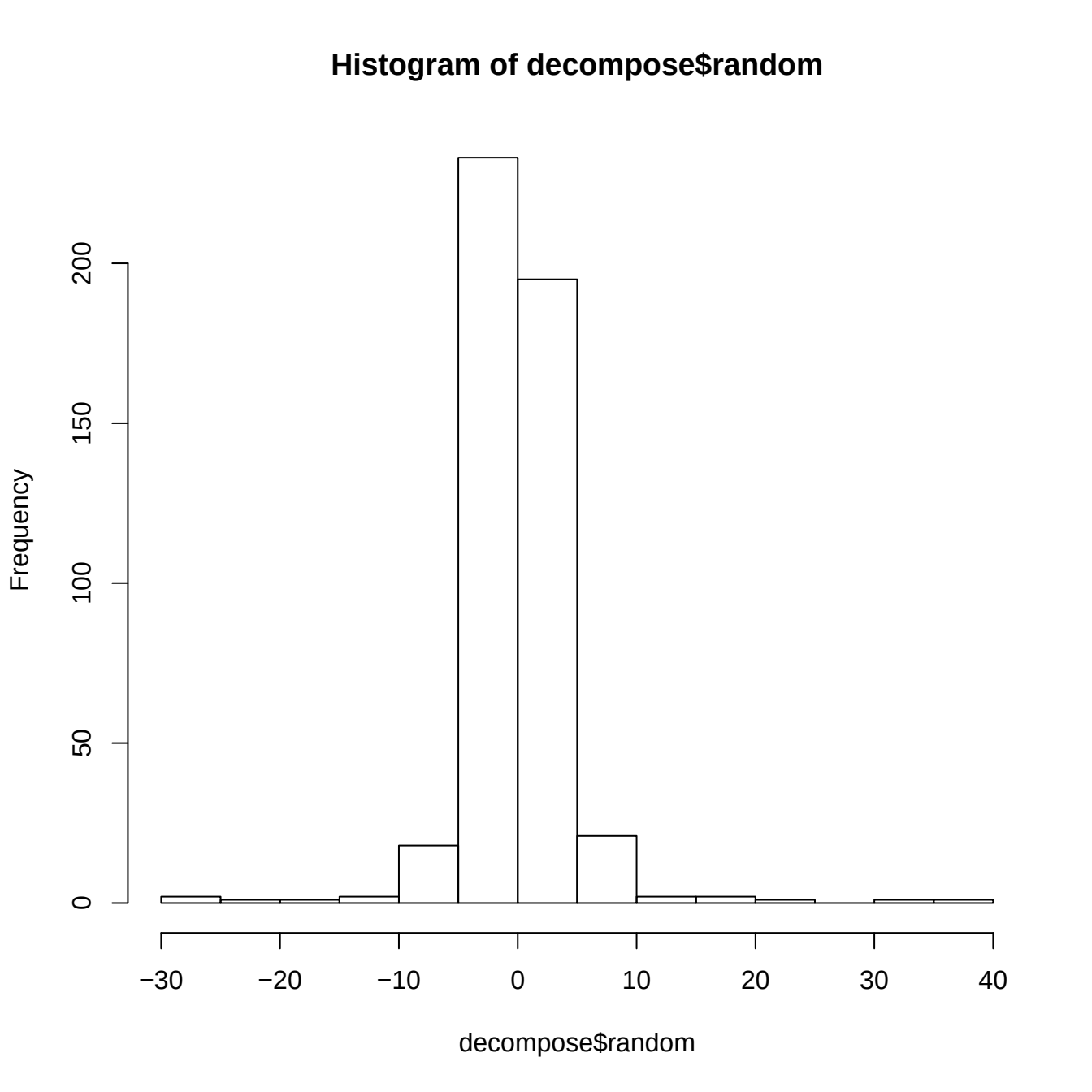
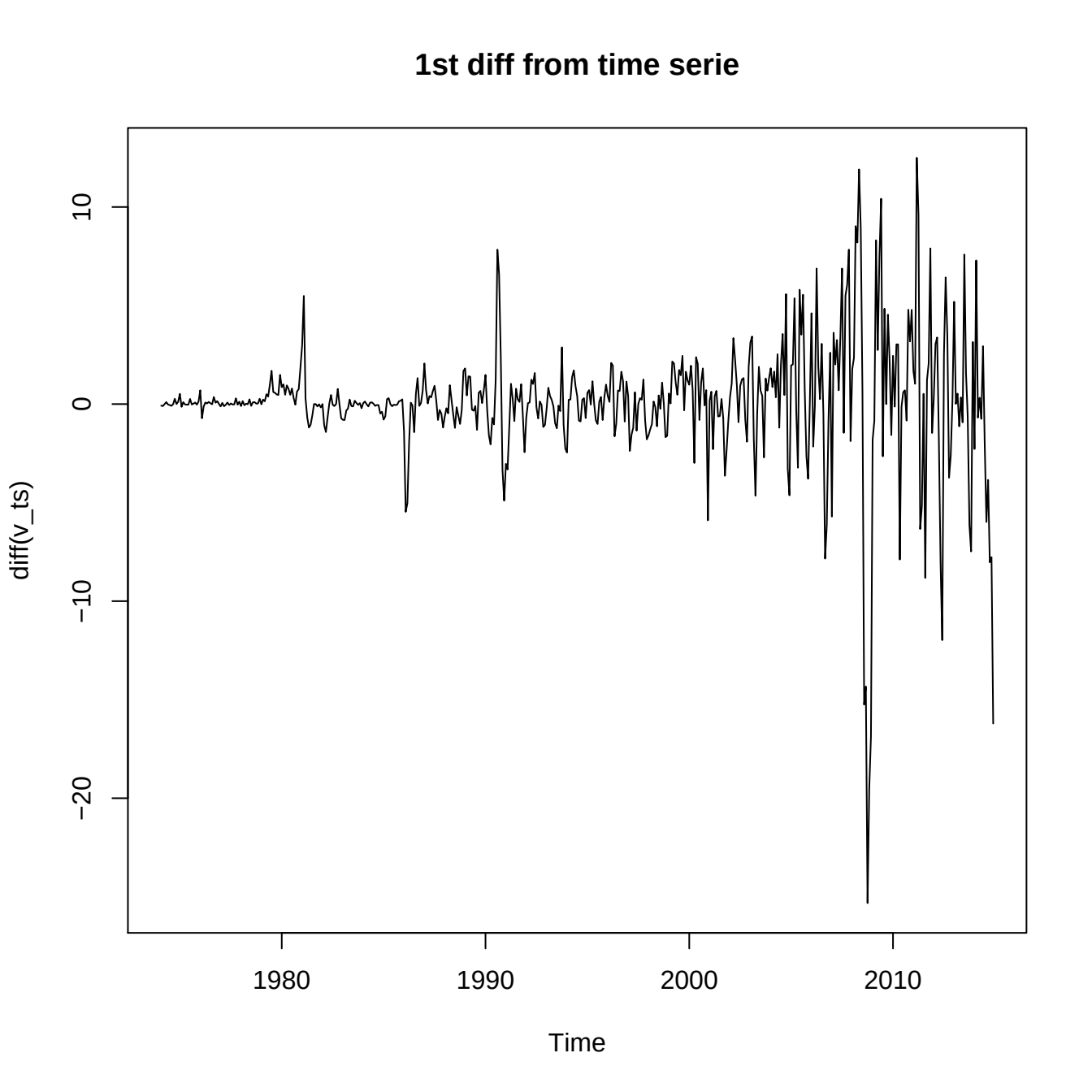
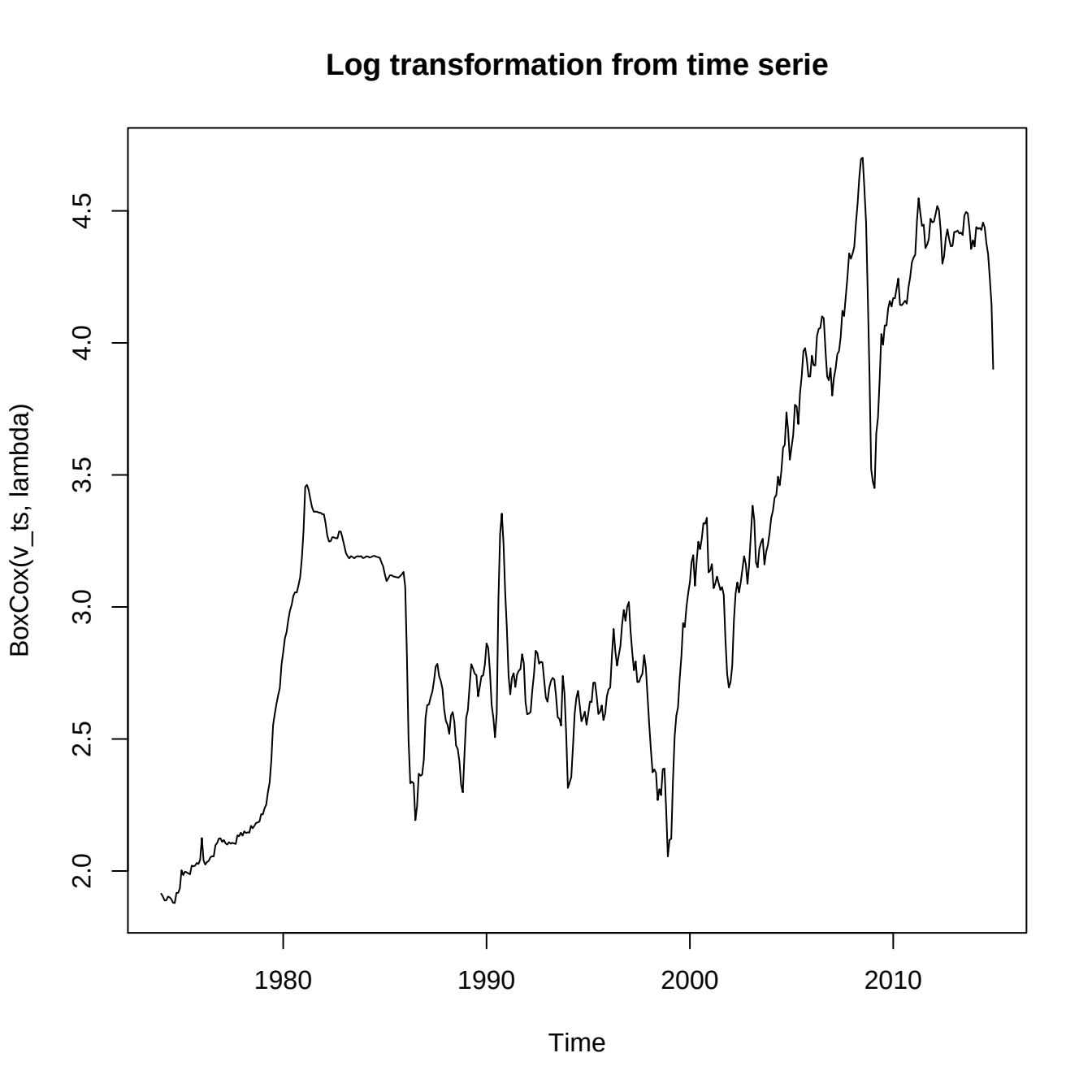
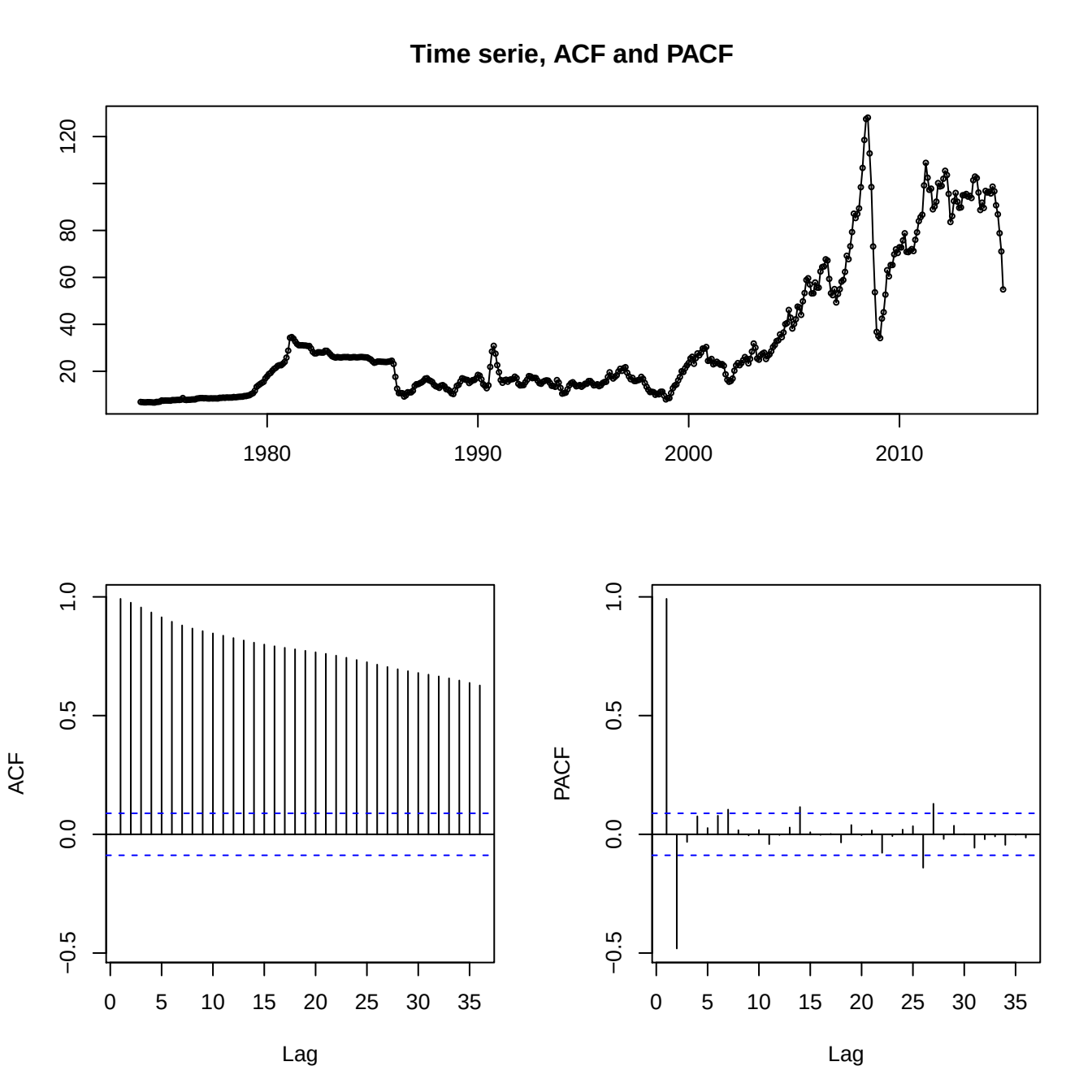
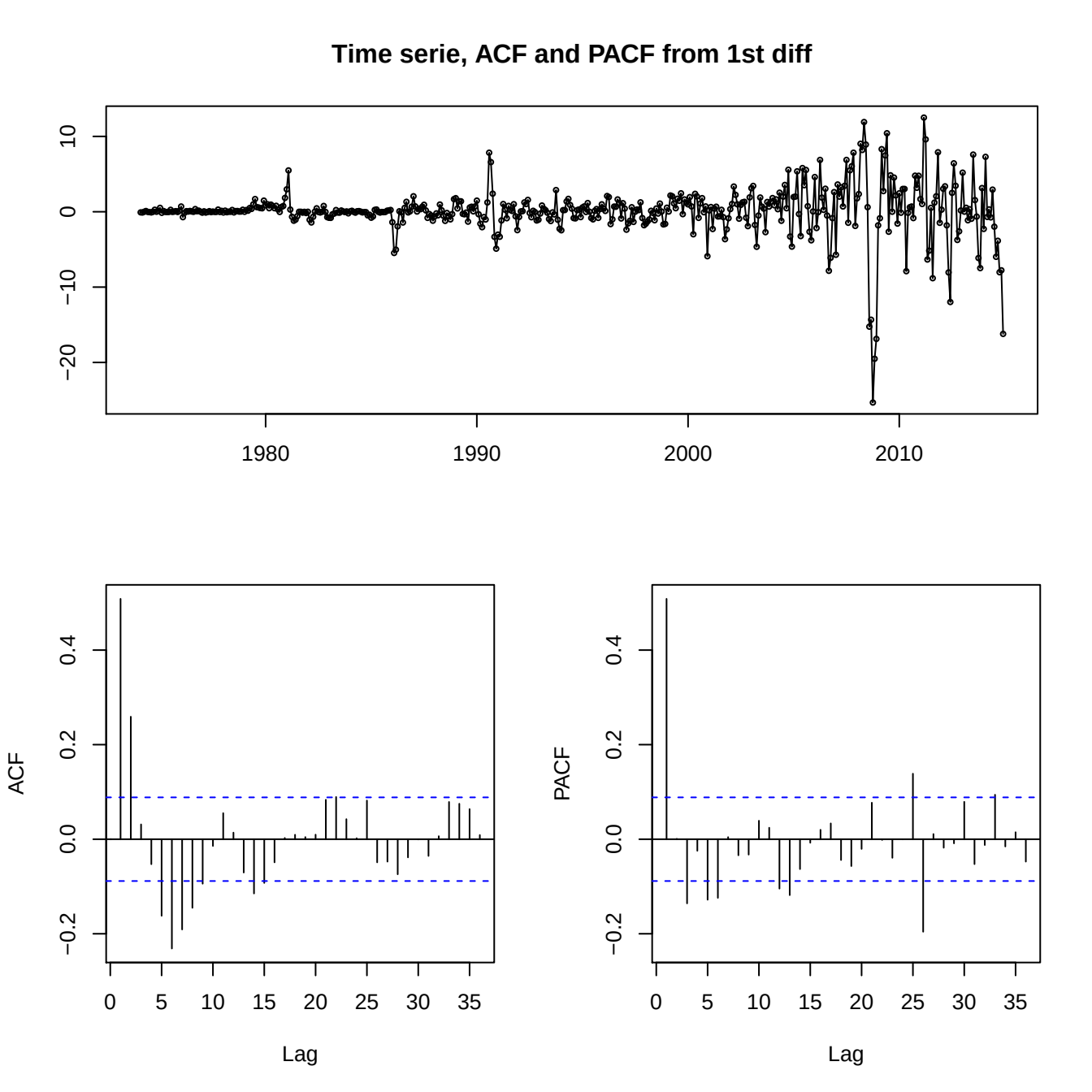

Decomposition of additive time series
observed
trend
seasonal
random
20
60
100
20
40
60
80
100
1.0
0.5
−0.5
−1.5
30
10
−10
−30
1980
1990
2000
2010
Time

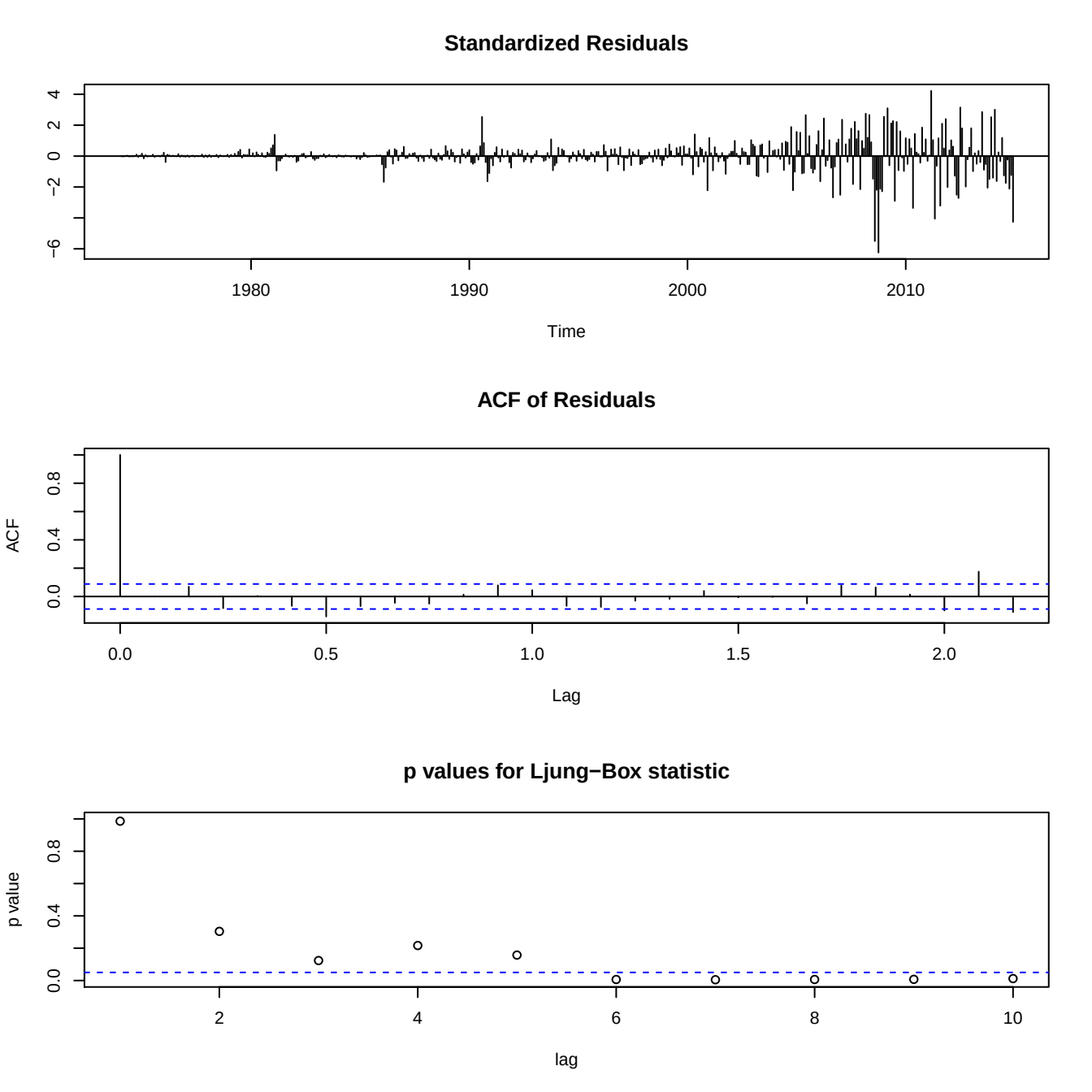

Histogram of decompose$random
Frequency
0
50
100
150
200
−30
−20
−10
0
10
20
30
40
decompose$random

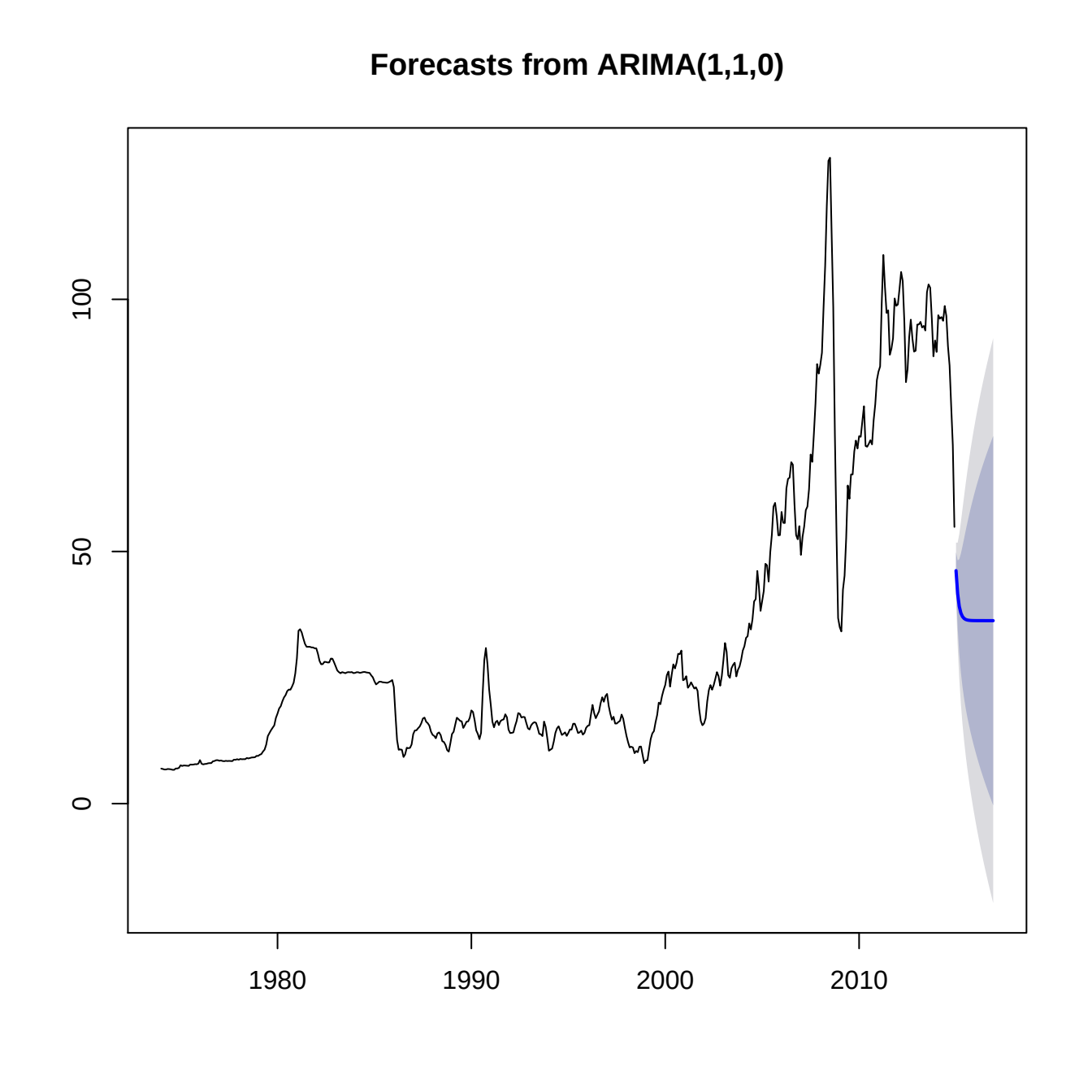

1st diff from time serie
diff(v_ts)
10
0
−10
−20
1980
1990
2000
2010
Time


Log transformation from time serie
BoxCox(v_ts, lambda)
2.0
2.5
3.0
3.5
4.0
4.5
1980
1990
2000
2010
Time


Time serie, ACF and PACF
120
80
60
40
20
1980
1990
2000
2010
ACF
1.0
0.5
0.0
−0.5
0
5
10
15
20
25
30
35
Lag
PACF
1.0
0.5
0.0
−0.5
0
5
10
15
20
25
30
35
Lag


Time serie, ACF and PACF from 1st diff
10
0
−10
−20
1980
1990
2000
2010
ACF
0.4
0.2
0.0
−0.2
0
5
10
15
20
25
30
35
Lag
PACF
0.4
0.2
0.0
−0.2
0
5
10
15
20
25
30
35
Lag


Standardized Residuals
4
2
0
−2
−6
1980
1990
2000
2010
Time
ACF of Residuals
ACF
0.8
0.4
0.0
0.0
0.5
1.0
1.5
2.0
Lag
p values for Ljung−Box statistic
p value
0.8
0.4
0.0
2
4
6
8
10
lag


Forecasts from ARIMA(1,1,0)
100
50
0
1980
1990
2000
2010