Unemployment Rate, We Do Not Want to Be the Contributor?

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Outline

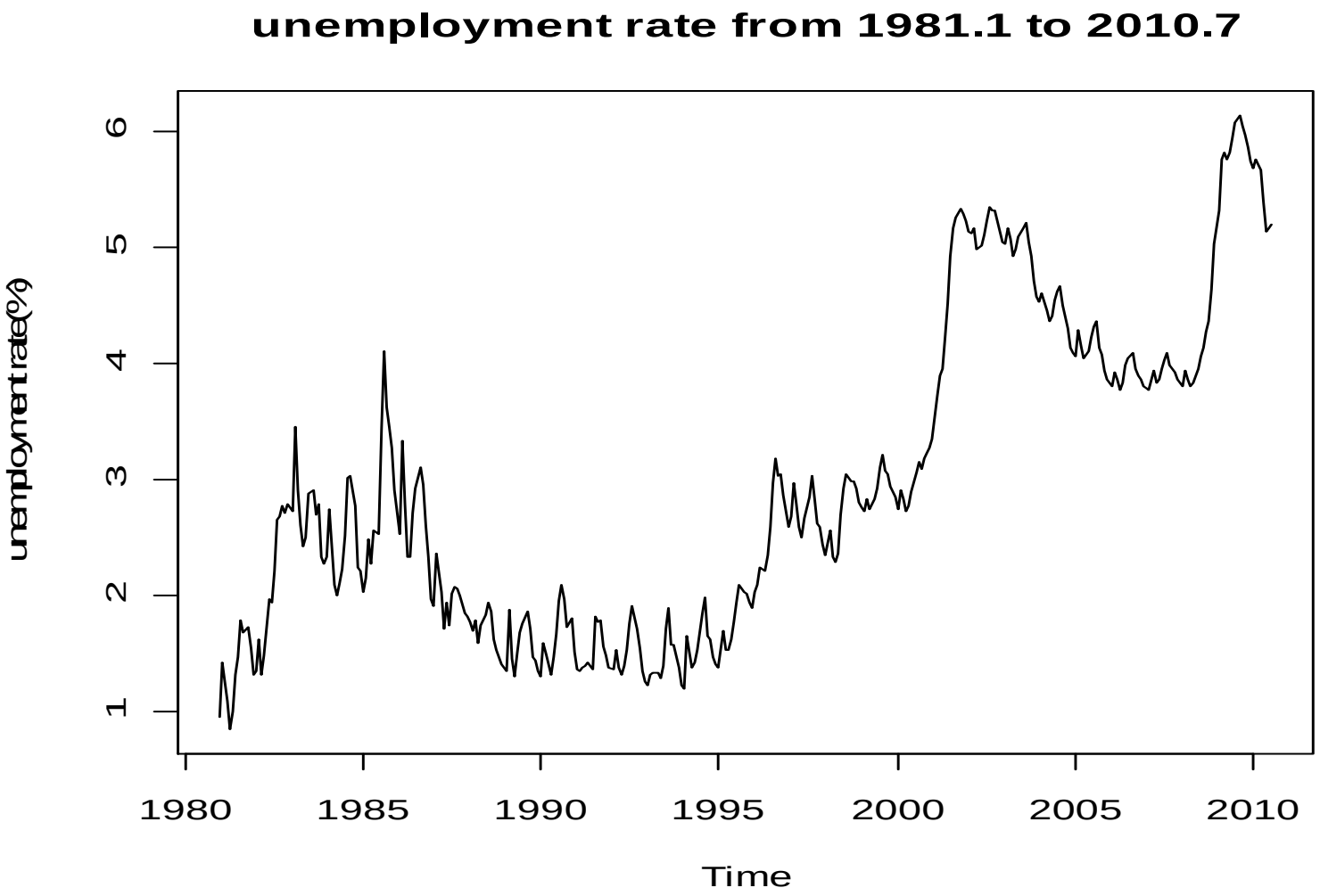
- Motivation
- Data
- Proposed method – GARCH
- Model selection
- Conclusions and future works
- Reference

Motivation

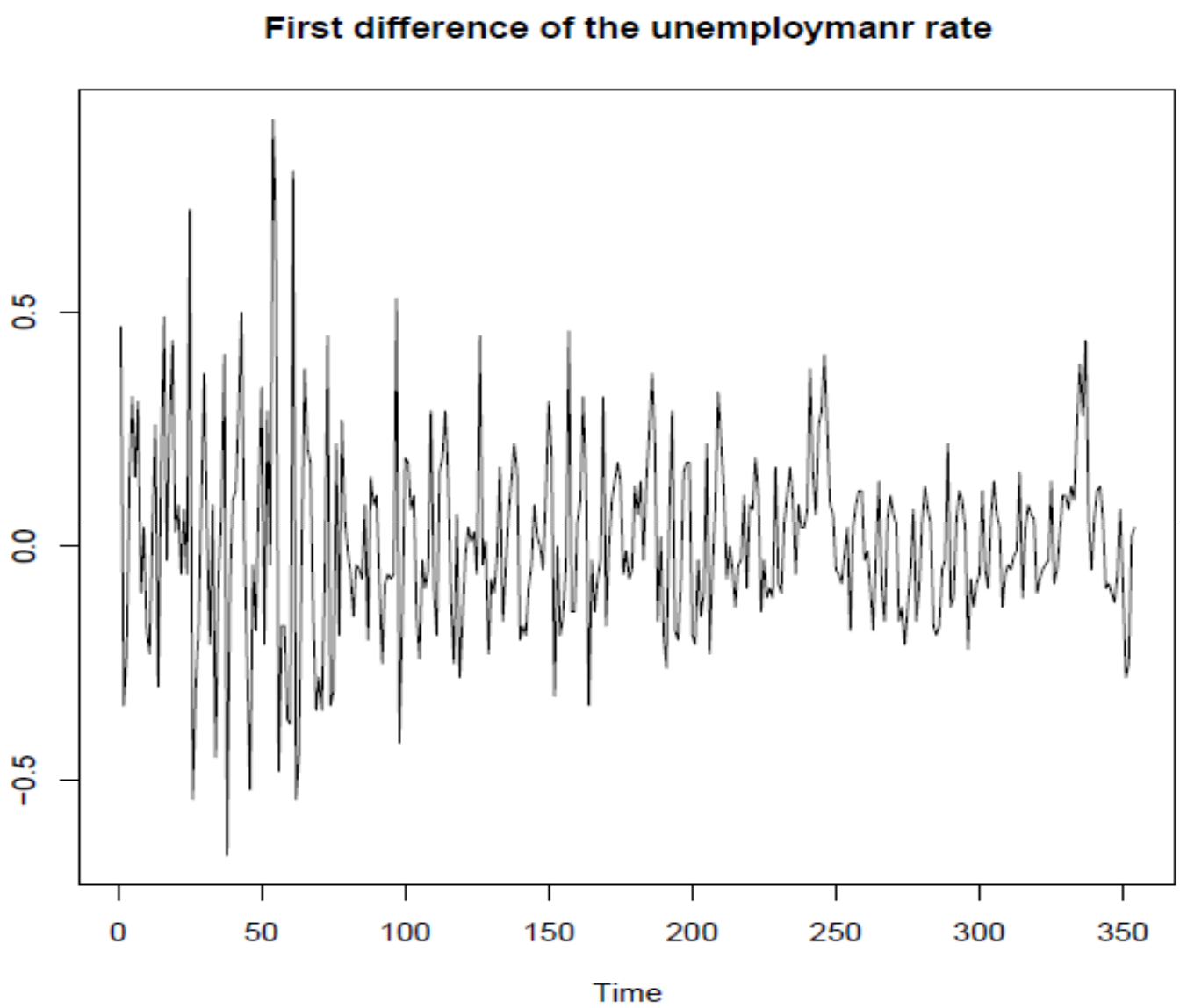
- Our president promised that he will let the unemployment rate decrease to 3%, so I want to understand the trend of the unemployment rate and check the possibility of what he said.

DATA

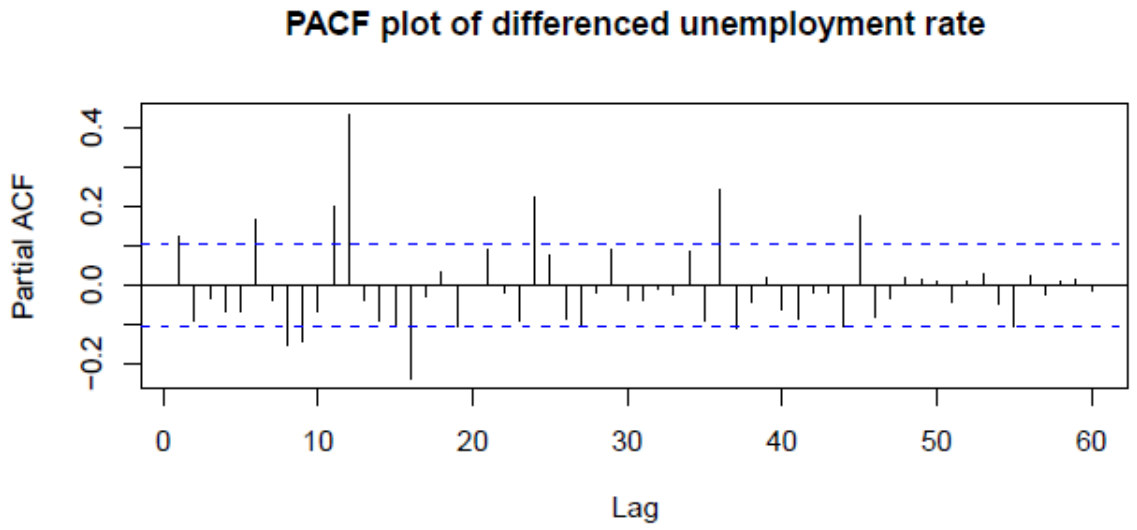
- The data is the monthly unemployment rate of Taiwan from 1981.1 to 2010.7.

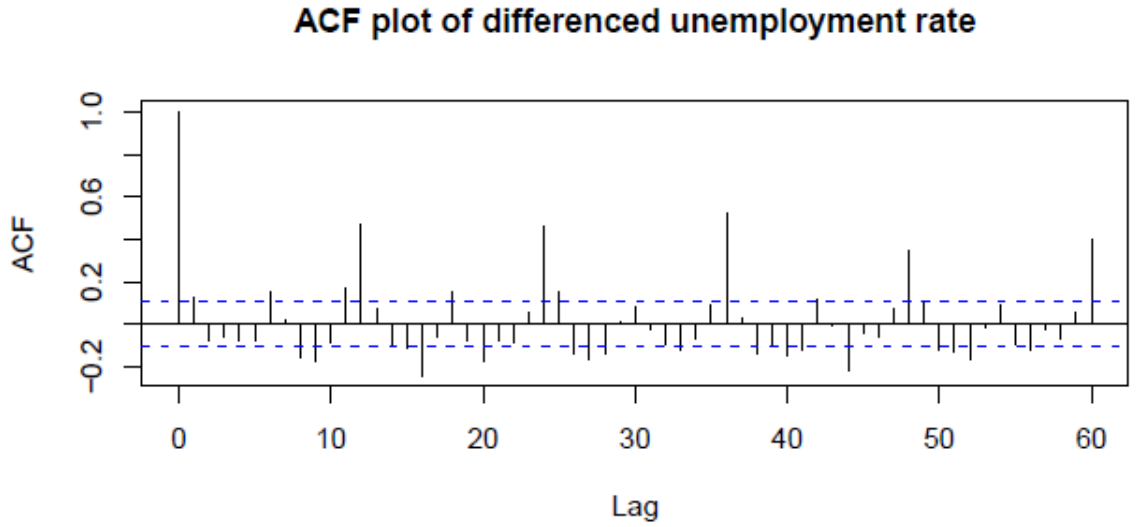


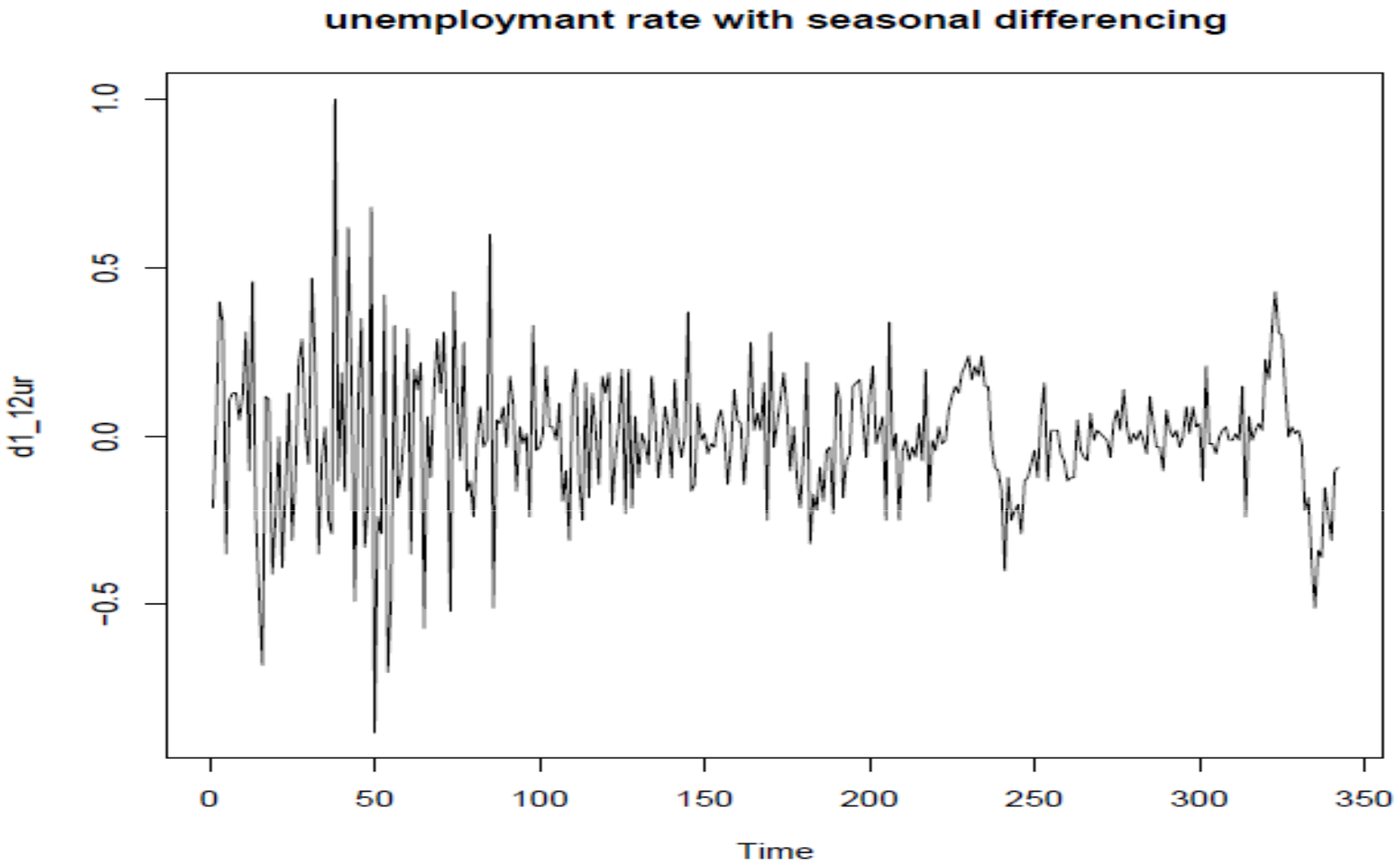
- It seems to have a linear trend.


First difference of the unemploymanr rate
0.5
0.0
−0.5
0
50
100
150
200
250
300
350
Time

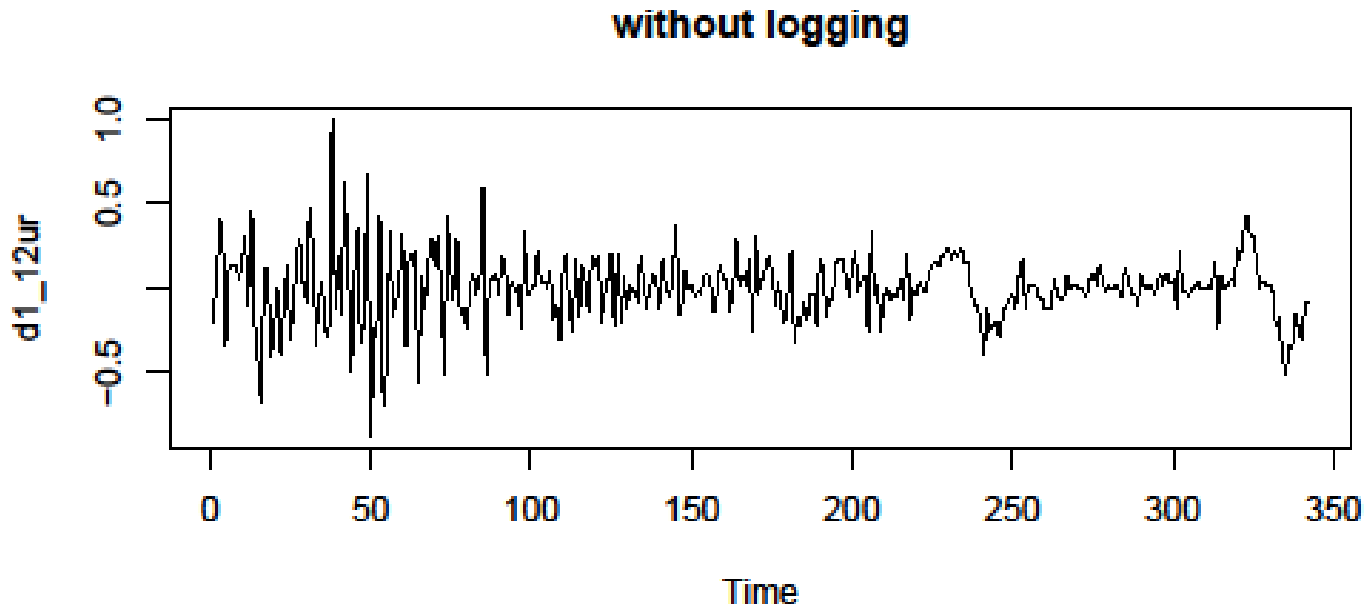
Check seasonal effect:

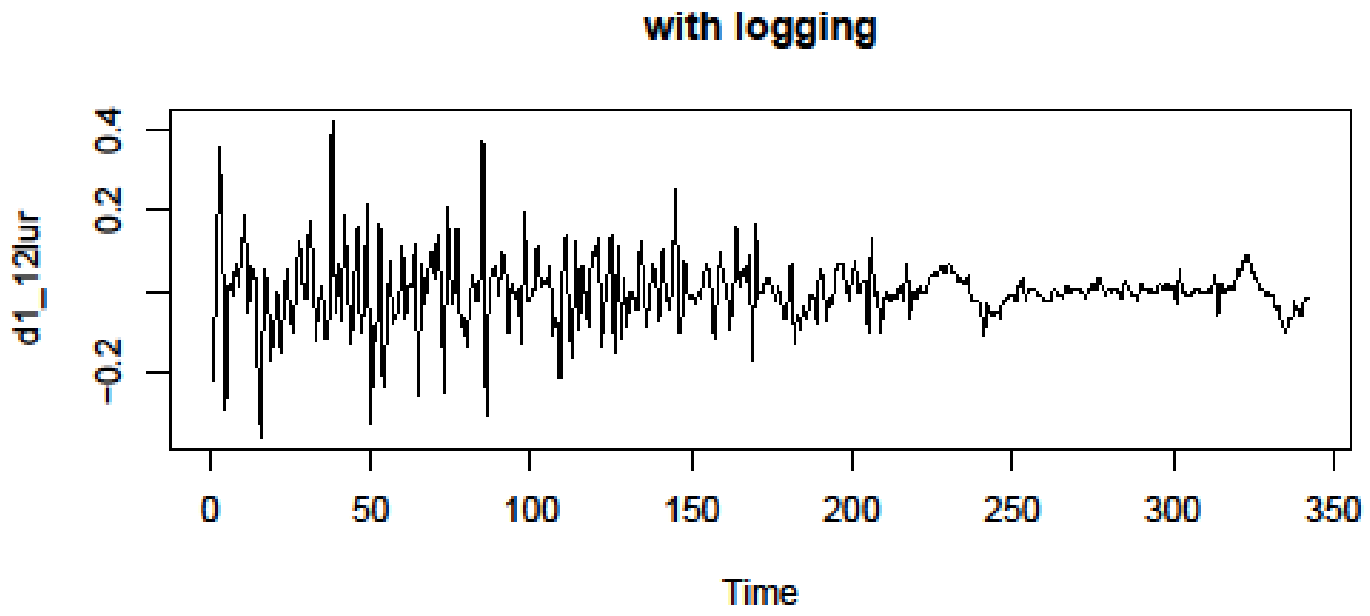






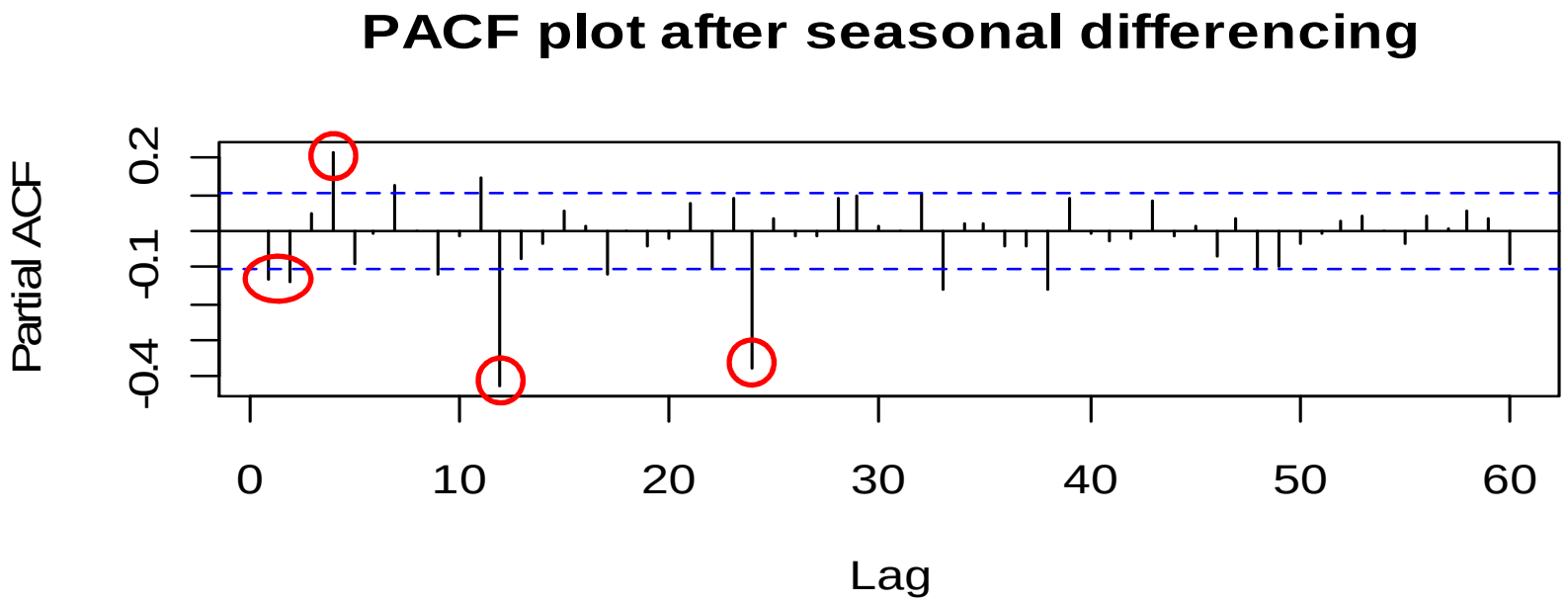
- Unsatisfied variance!

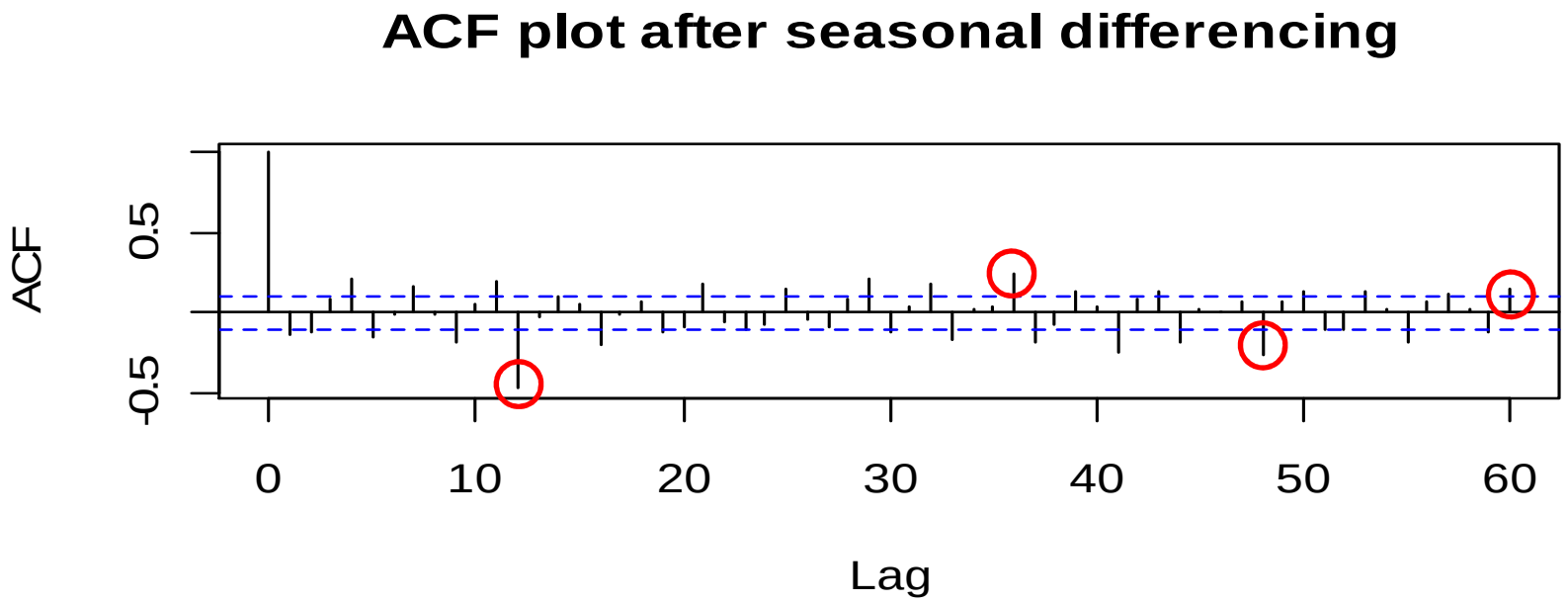

without logging
d1_12ur
1.0
0.5
−0.5
0
50
100
150
200
250
300
350
Time


with logging
d1_12lur
0.4
0.2
−0.2
0
50
100
150
200
250
300
350
Time

Modeling:

- $Y \sim \text{sarima}(p, d, q) \times (P, D, Q)_{12} - \text{GARCH}(r, m)$
- $Y \sim \text{GARCH}(r, m)$

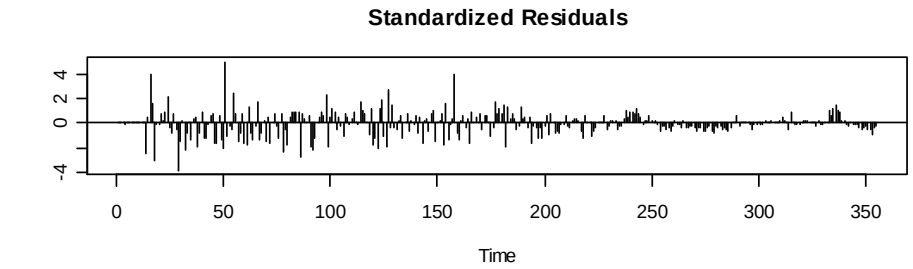

PACF plot after seasonal differencing
Partial ACF
0.2
-0.1
-0.4
0
10
20
30
40
50
60
Lag

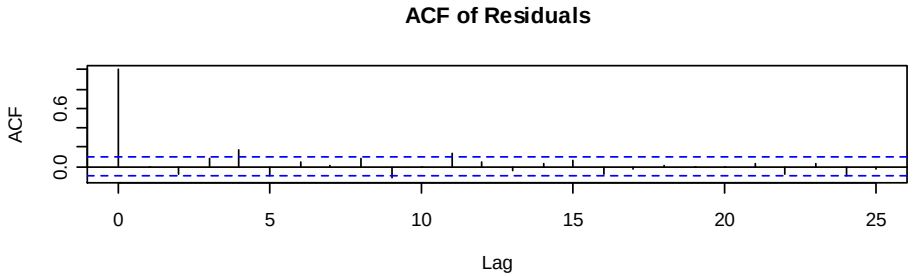

ACF plot after seasonal differencing
ACF
0.5
-0.5
0
10
20
30
40
50
60
Lag

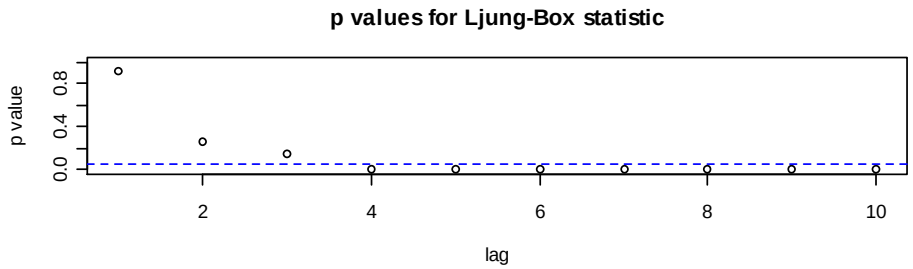
Candidate model:

(p, d, q)		(P, D, Q)
		(2, 1, 0)
(1, 1, 0)		(2, 1, 1)
(2, 1, 0)	x	(2, 1, 2)
(3, 1, 0)		(2, 1, 3)
(4, 1, 0)		(2, 1, 4)
		(2, 1, 5)

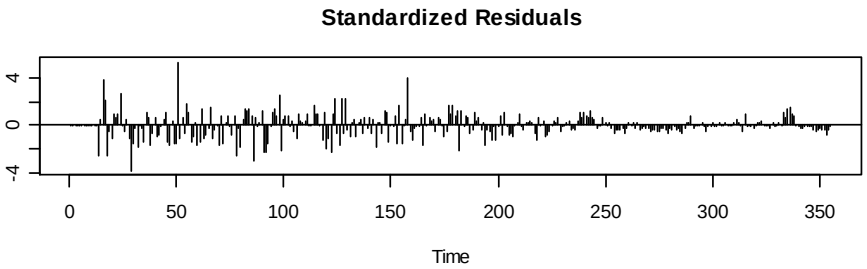
$sarima(1, 1, 0)x(2, 1, 0)_{12}$

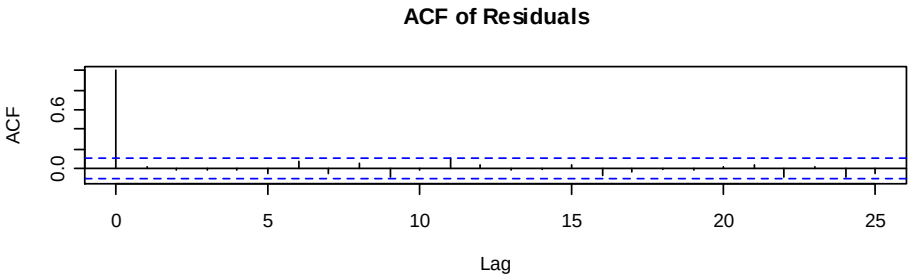


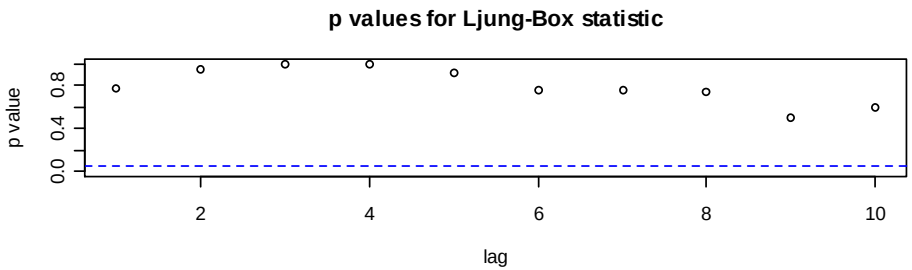




$sarima(4, 1, 0)x(2, 1, 0)_{12}$

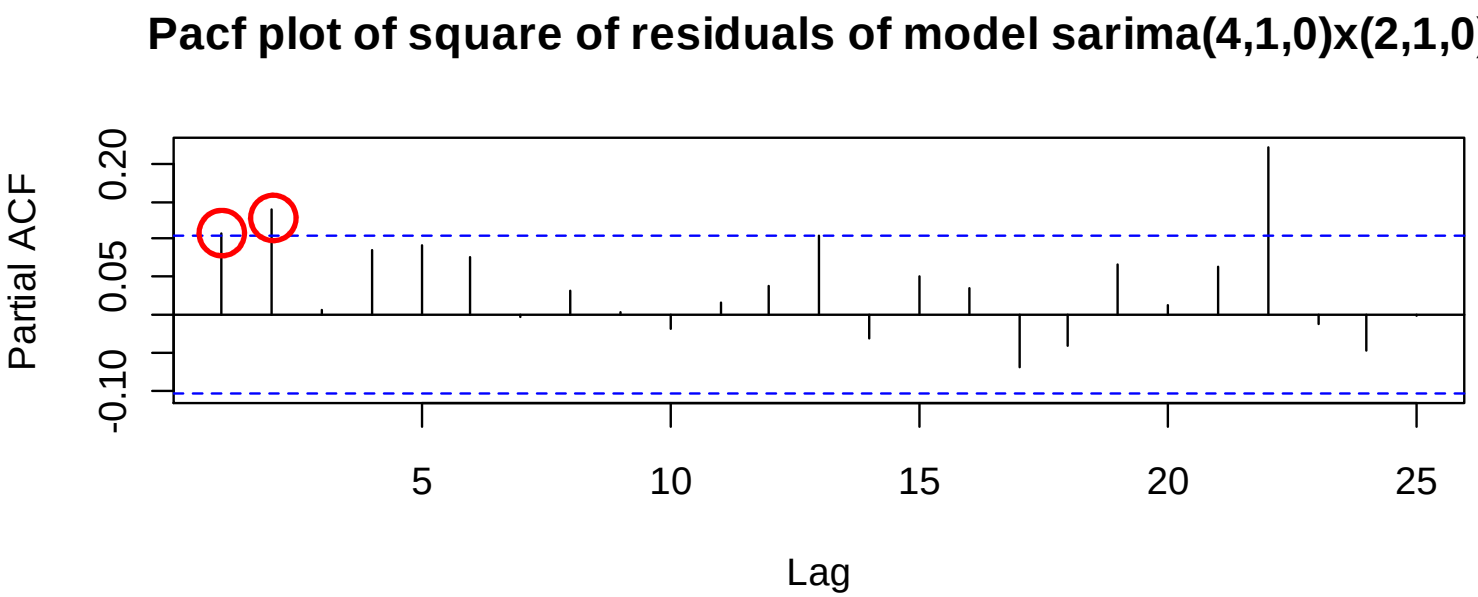


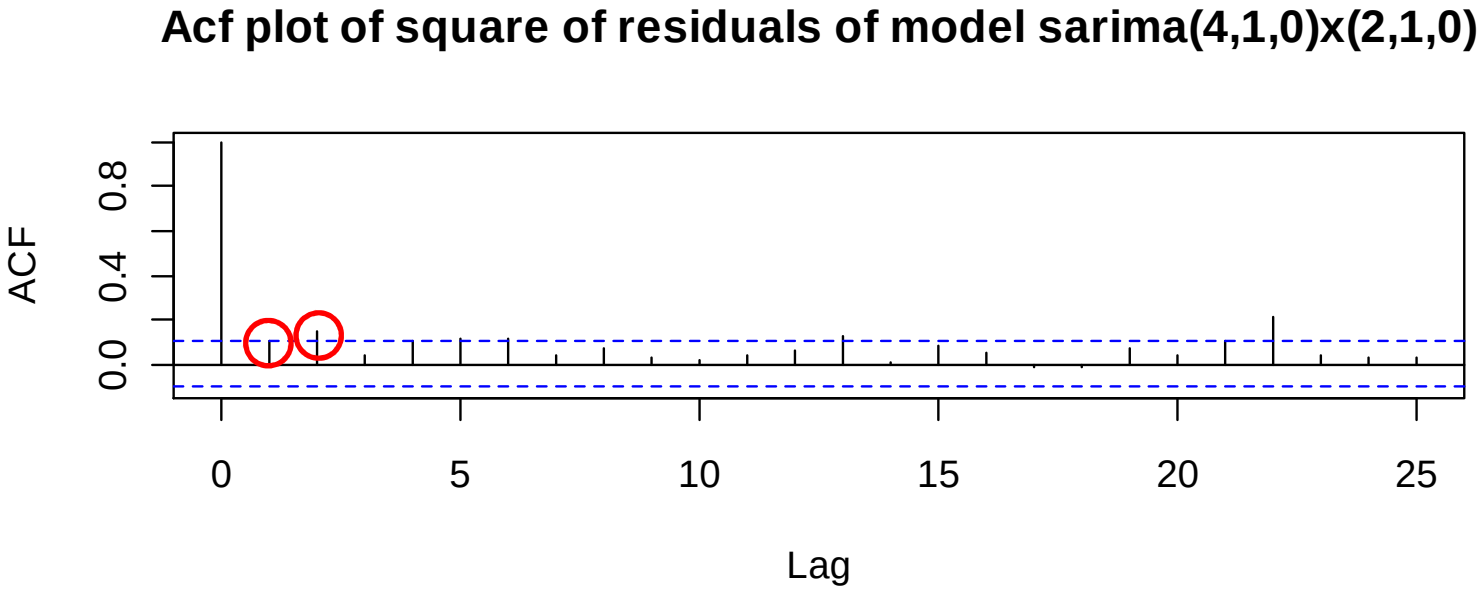




Adequate model:

(p, d, q)		(P, D, Q)
(2, 1, 0)	x	(2, 1, 5)
(3, 1, 0)	x	(2, 1, 5)
(4, 1, 0)	x	(2, 1, 0)
		(2, 1, 1)
		(2, 1, 2)
		(2, 1, 3)
		(2, 1, 4)
		(2, 1, 5)

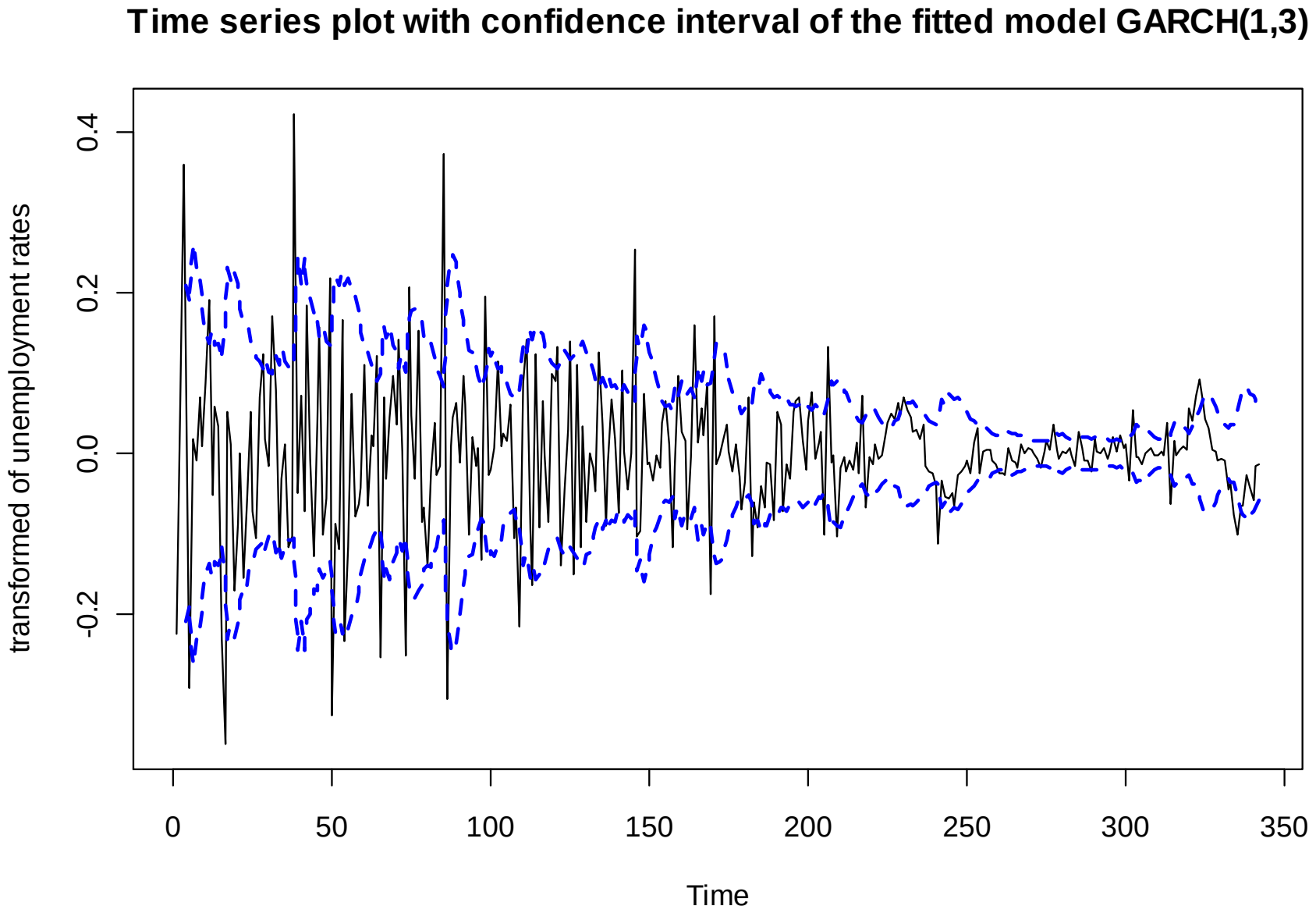

Pacf plot of square of residuals of model sarima(4,1,0)x(2,1,0)
Partial ACF
0.20
0.05
-0.10
5
10
15
20
25
Lag


Acf plot of square of residuals of model sarima(4,1,0)x(2,1,0)
ACF
0.8
0.4
0.0
0
5
10
15
20
25
Lag

```
Call:
garch(x = res4, order = c(0, 1))

Model:
GARCH(0,1)

Residuals:
      Min         1Q    Median         3Q        Max
-3.727307 -0.516656 -0.001803  0.498677  4.944749

Coefficient(s):
    Estimate  Std. Error  t value Pr(>|t|)
a0 0.0020649   0.0001659   12.447  < 2e-16 ***
a1 0.8723988   0.1217660    7.165  7.8e-13 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Diagnostic Tests:
        Jarque Bera Test

data:  Residuals
X-squared = 201.2361, df = 2, p-value < 2.2e-16


        Box-Ljung test

data:  Squared.Residuals
X-squared = 2.3096, df = 1, p-value = 0.1286
```

Model selection

Model	AIC
SARIMA(2, 1, 0) x $(2, 1, 5)_{12}$-GARCH(2, 2)	**-5.849987**
GARCH(1,3)	**-5.853721**


Time series plot with confidence interval of the fitted model GARCH(1,3)
transformed of unemployment rates
0.4
0.2
0.0
-0.2
0
50
100
150
200
250
300
350
Time

Conclusions and future works

- Not all of the points lies in the confidence band, so I think GARCH model is not good enough to fit the unemployment rate of Taiwan.
- My future work is to find another model to fit the unemployment rate of Taiwan and I will do the same thing on the data of China, then I will figure out the dependency between the unemployment rate in Taiwan and in China by copula.

Reference:

- Directorate – General of Budget, Accounting and Statistics, Executive Yuan, R.O.C.(行政院主計處)
- http://www.dgbas.gov.tw/ct.asp?xItem=17144&ctNode=3246