ShSt-5.3.R

jonat

Mon Mar 18 09:08:54 2019

SKITSE til opgave ShSt 5.3

Bemærk: Med RStudio kompileres script til output med genvej Ctrl-Shift-K. Data og relevante differenser og lags

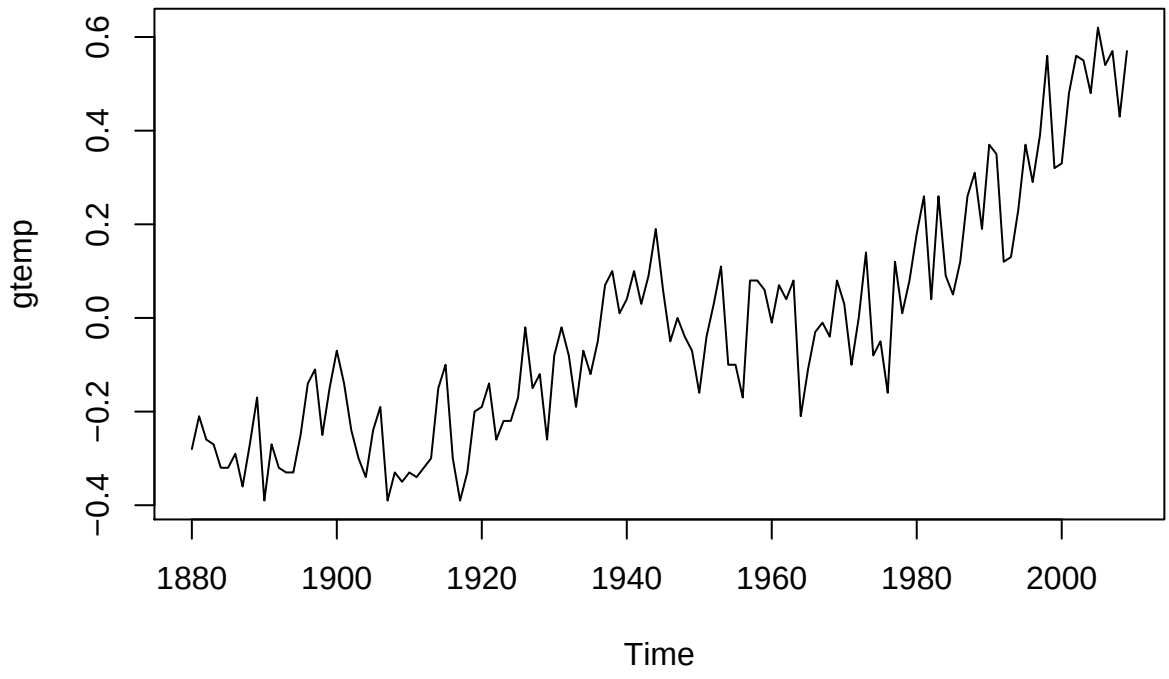
```
library(astsa)
```

```
## Warning: package 'astsa' was built under R version 3.5.2
```

```
library(tseries)
```

```
## Warning: package 'tseries' was built under R version 3.5.2
```

```
plot(gtemp)
```



```r
n <- length(gtemp)
trend <- 1:n
x <- gtemp
x1 <- c(NA, gtemp[1:(n-1)])  # Lag(x,1) med NA som første værdi
dx <- x-x1                   # Dif(x) med NA som første værdi
dx1 <- c(NA, dx[1:(n-1)])    # Lag(Dif(x)) med NA'er som første værdier
dx2 <- c(NA, dx1[1:(n-1)])   # Lag(Dif(x),2) med NA'er som første værdier
dx3 <- c(NA, dx2[1:(n-1)])   # Lag(Dif(x),3) med NA'er som første værdier
dx4 <- c(NA, dx3[1:(n-1)])   # Lag(Dif(x),4) med NA'er som første værdier
head(data.frame(x, x1, dx, dx1, dx2, dx3, dx4))
```

```
##       x    x1    dx   dx1   dx2   dx3  dx4
## 1 -0.28    NA    NA    NA    NA    NA   NA
## 2 -0.21 -0.28  0.07    NA    NA    NA   NA
## 3 -0.26 -0.21 -0.05  0.07    NA    NA   NA
## 4 -0.27 -0.26 -0.01 -0.05  0.07    NA   NA
## 5 -0.32 -0.27 -0.05 -0.01 -0.05  0.07   NA
## 6 -0.32 -0.32  0.00 -0.05 -0.01 -0.05 0.07
```

Alm. DF test med check af om residualer er autokorrelerede

```r
adf.test(x, k=0)  # DF test
```

```
## Warning in adf.test(x, k = 0): p-value smaller than printed p-value
```

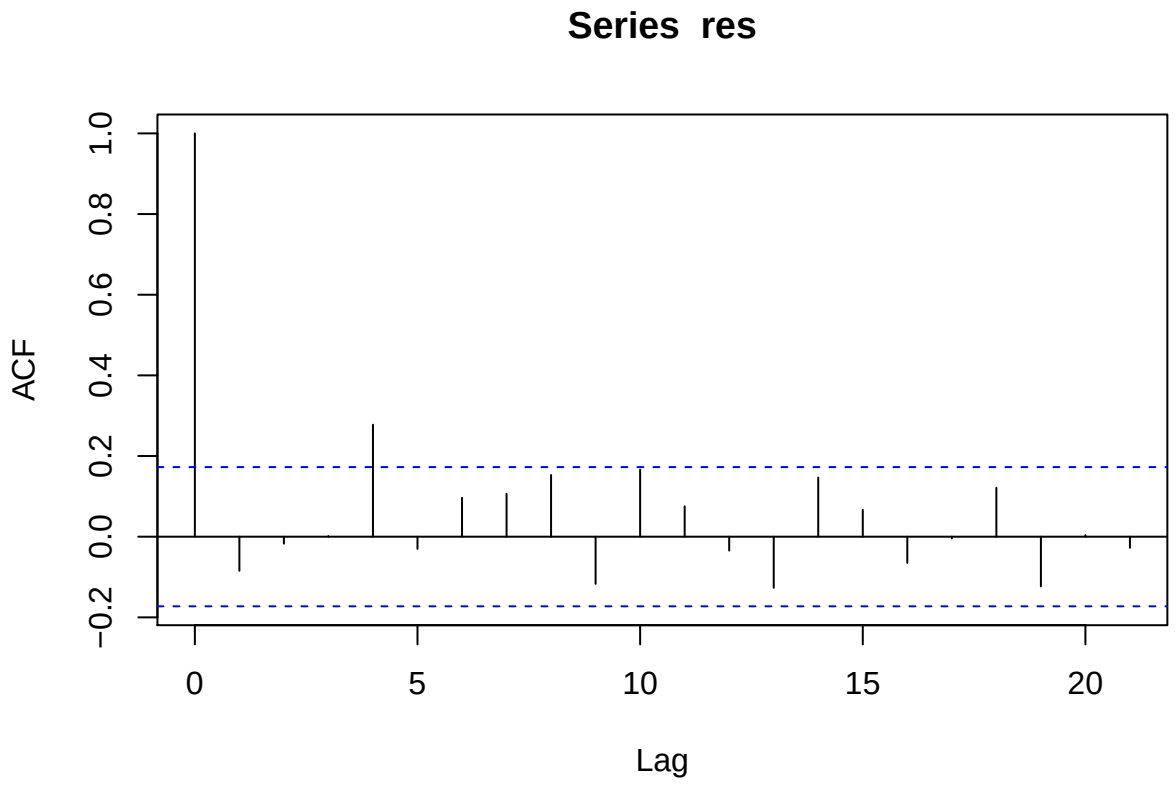
```
##
##  Augmented Dickey-Fuller Test
##
## data:  x
## Dickey-Fuller = -5.3886, Lag order = 0, p-value = 0.01
## alternative hypothesis: stationary
```

```r
model <- lm(dx ~ trend + x1)
res <- residuals(model)
summary(model) # Bemærk t-værdi for `x1` er DF-teststatistik
```

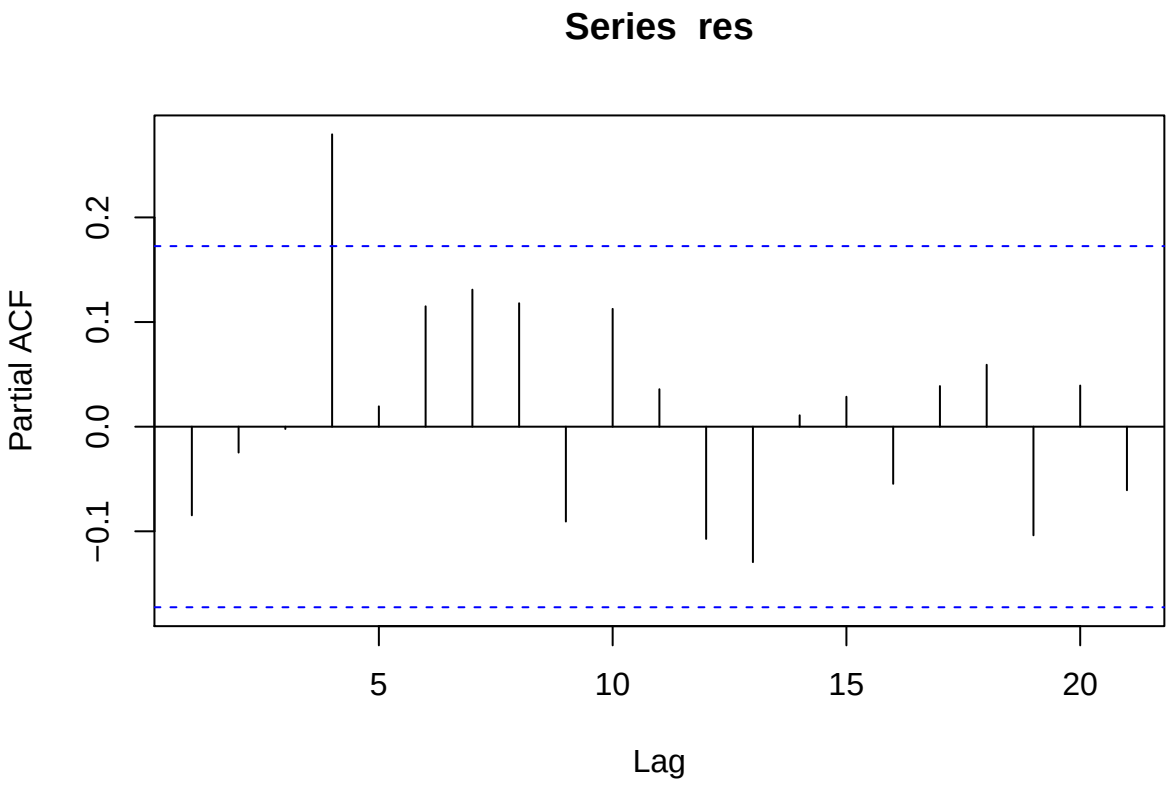
```
##
## Call:
## lm(formula = dx ~ trend + x1)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.29946 -0.05511  0.00306  0.07522  0.20144
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.1550755  0.0336410  -4.610 9.75e-06 ***
## trend        0.0022971  0.0004675   4.914 2.72e-06 ***
## x1          -0.3838909  0.0712407  -5.389 3.36e-07 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.0996 on 126 degrees of freedom
##   (1 observation deleted due to missingness)
## Multiple R-squared:  0.1887, Adjusted R-squared:  0.1758
## F-statistic: 14.65 on 2 and 126 DF,  p-value: 1.902e-06
```

```
acf(res)
```




```
pacf(res)
```



Augm. DF test med lag 1 og check af om residualer er autokorrelerede

```
adf.test(x, k=1)  # ADF test 1 lag
```

```
## Warning in adf.test(x, k = 1): p-value smaller than printed p-value
```

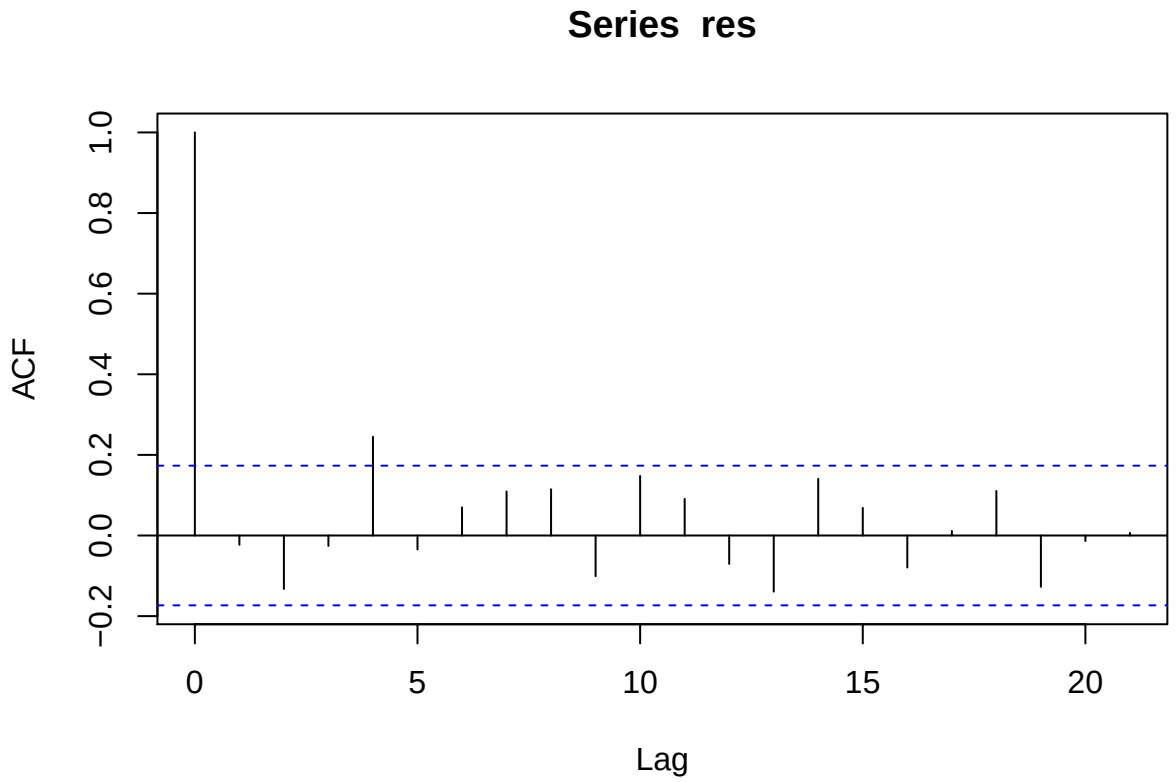
```
##
##  Augmented Dickey-Fuller Test
##
## data:  x
## Dickey-Fuller = -4.2912, Lag order = 1, p-value = 0.01
## alternative hypothesis: stationary
```

```
model <- lm(dx ~ trend + x1 + dx1)
res <- residuals(model)
summary(model) # Bemærk t-værdi for `x1` er DF-teststatistik
```

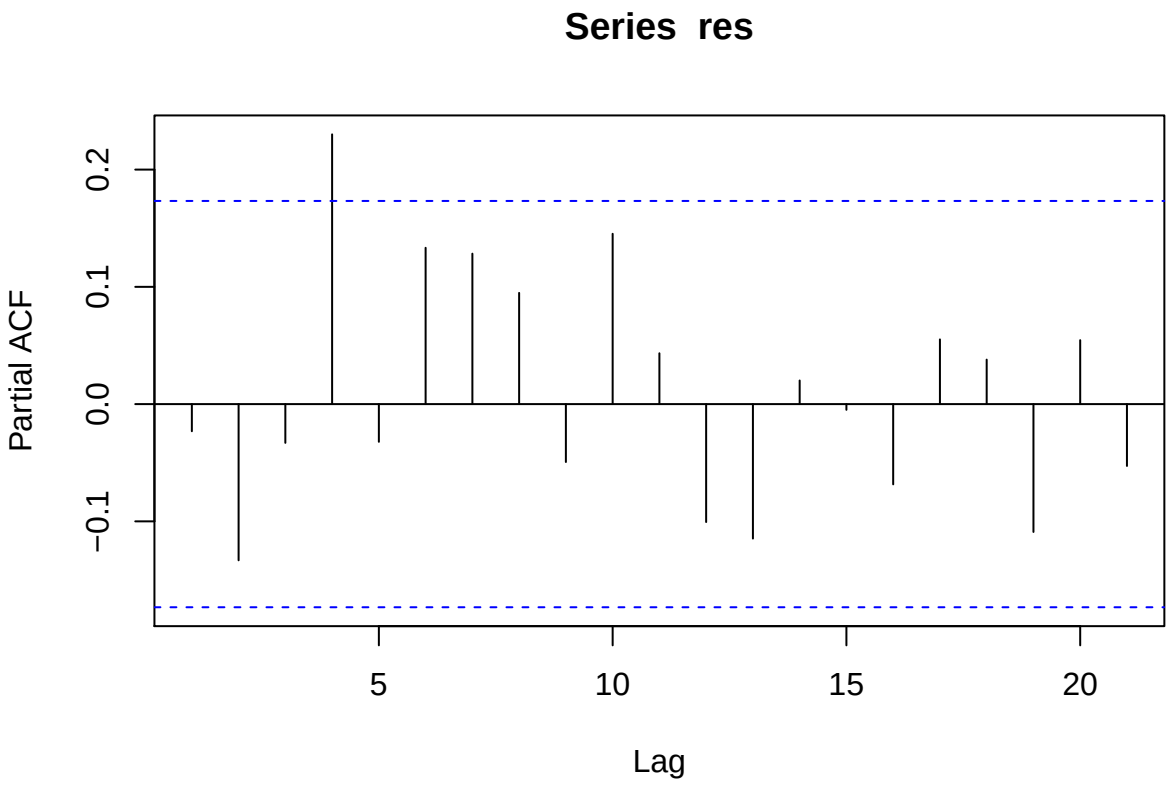
```
##
## Call:
## lm(formula = dx ~ trend + x1 + dx1)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.295013 -0.061943 -0.002861  0.075283  0.206805
##
```

```
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
## (Intercept) -0.1408783  0.0367318  -3.835 0.000199 ***
## trend        0.0020971  0.0005078   4.129 6.63e-05 ***
## x1          -0.3398664  0.0792012  -4.291 3.55e-05 ***
## dx1         -0.1293606  0.0894813  -1.446 0.150792
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.09903 on 124 degrees of freedom
##   (2 observations deleted due to missingness)
## Multiple R-squared:  0.2085, Adjusted R-squared:  0.1894
## F-statistic: 10.89 on 3 and 124 DF,  p-value: 2.124e-06
```

```
acf(res)
```




```
pacf(res)
```



Augm. DF test med lag 4 og check af om residualer er autokorrelerede

```
adf.test(x, k=4)  # ADF test 4 lags
```

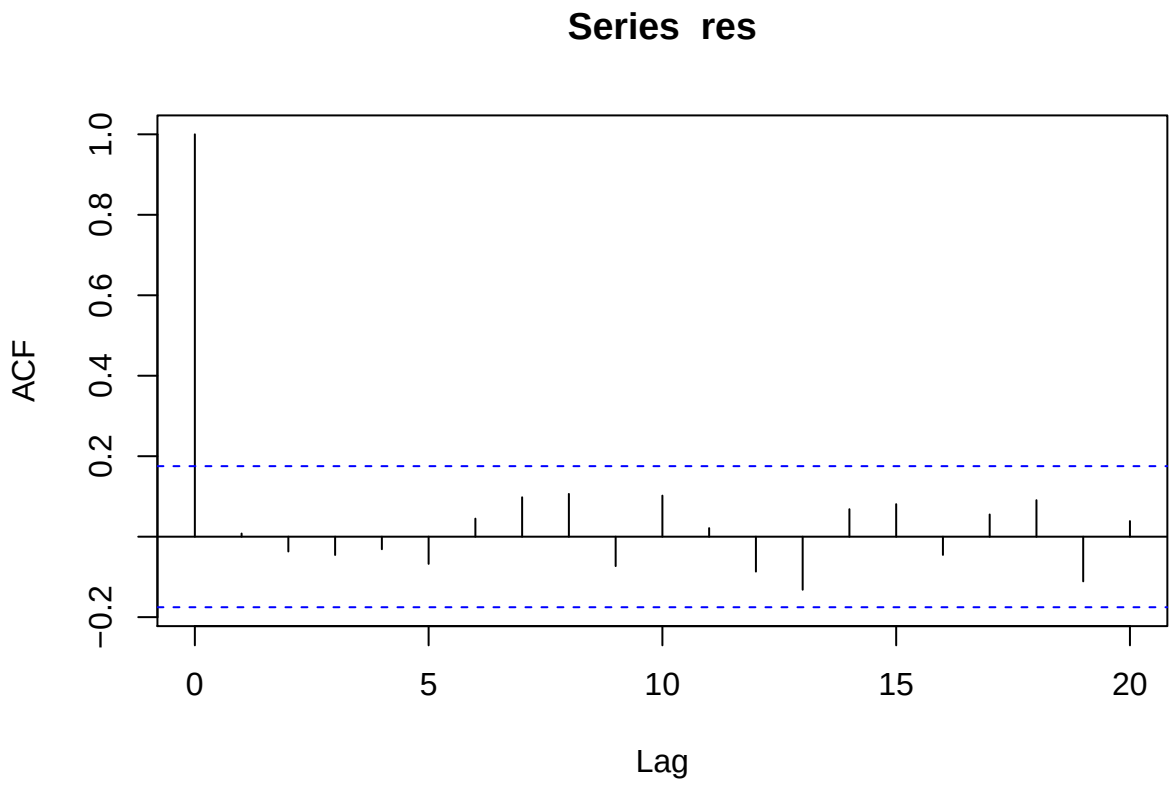
```
##
##  Augmented Dickey-Fuller Test
##
## data:  x
## Dickey-Fuller = -2.2942, Lag order = 4, p-value = 0.4542
## alternative hypothesis: stationary
```

```
model <- lm(dx ~ trend + x1 + dx1 + dx2 + dx3 + dx4)
res <- residuals(model)
summary(model) # Bemærk t-værdi for `x1` er DF-teststatistik
```

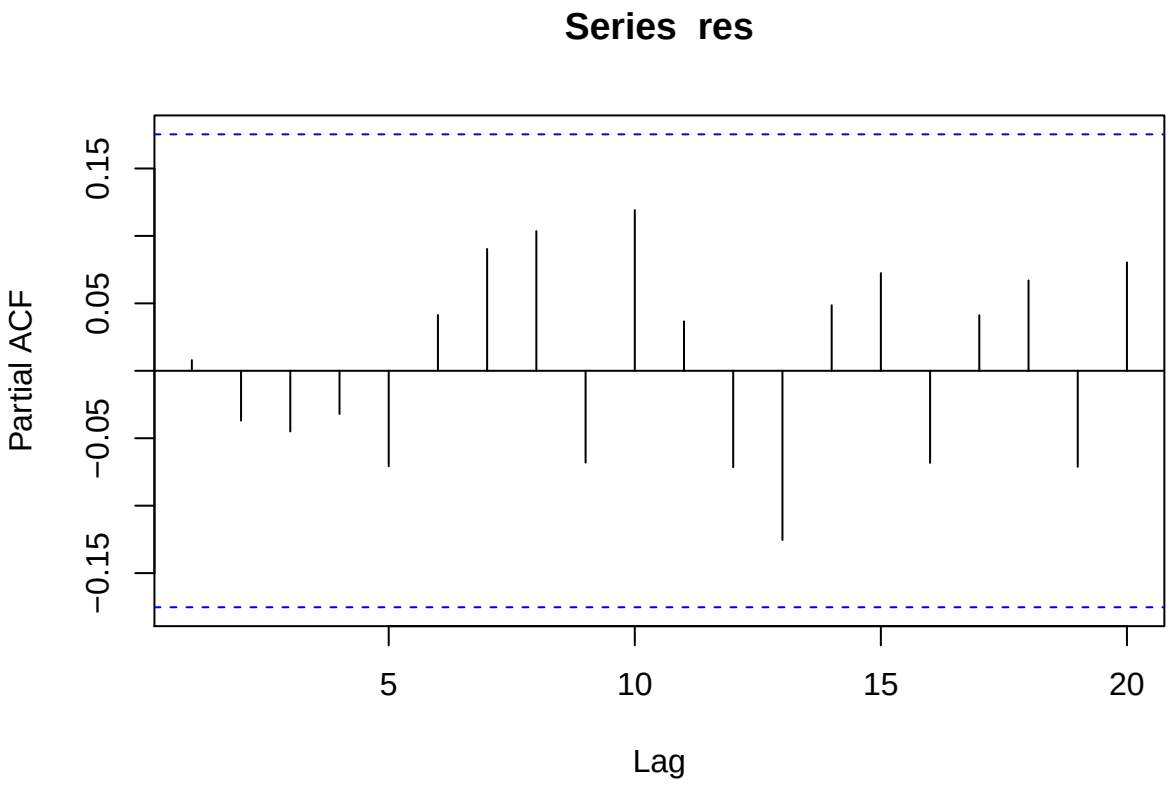
```
##
## Call:
## lm(formula = dx ~ trend + x1 + dx1 + dx2 + dx3 + dx4)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.278828 -0.065591  0.003956  0.071719  0.207917
##
## Coefficients:
##               Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept) -0.0911482  0.0427236  -2.133   0.0350 *
## trend        0.0014523  0.0005761   2.521   0.0130 *
## x1          -0.2139660  0.0932631  -2.294   0.0235 *
## dx1         -0.3033970  0.1161727  -2.612   0.0102 *
## dx2         -0.2715057  0.1125535  -2.412   0.0174 *
## dx3         -0.2339011  0.1042280  -2.244   0.0267 *
## dx4          0.0521612  0.0947827   0.550   0.5831
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.09653 on 118 degrees of freedom
##   (5 observations deleted due to missingness)
## Multiple R-squared:  0.2813, Adjusted R-squared:  0.2448
## F-statistic: 7.698 on 6 and 118 DF,  p-value: 5.42e-07
```

```
acf(res)
```




```
pacf(res)
```



Automatisk augm. DF test og PP test

```
adf.test(x)  # DF test med automatisk valg af k
```

```
##
##  Augmented Dickey-Fuller Test
##
## data:  x
## Dickey-Fuller = -1.6893, Lag order = 5, p-value = 0.7057
## alternative hypothesis: stationary
```

```
pp.test(x)        # PP test
```

```
## Warning in pp.test(x): p-value smaller than printed p-value
```

```
##
##  Phillips-Perron Unit Root Test
##
## data:  x
## Dickey-Fuller Z(alpha) = -47.702, Truncation lag parameter = 4,
## p-value = 0.01
## alternative hypothesis: stationary
```