Kursusgang 7

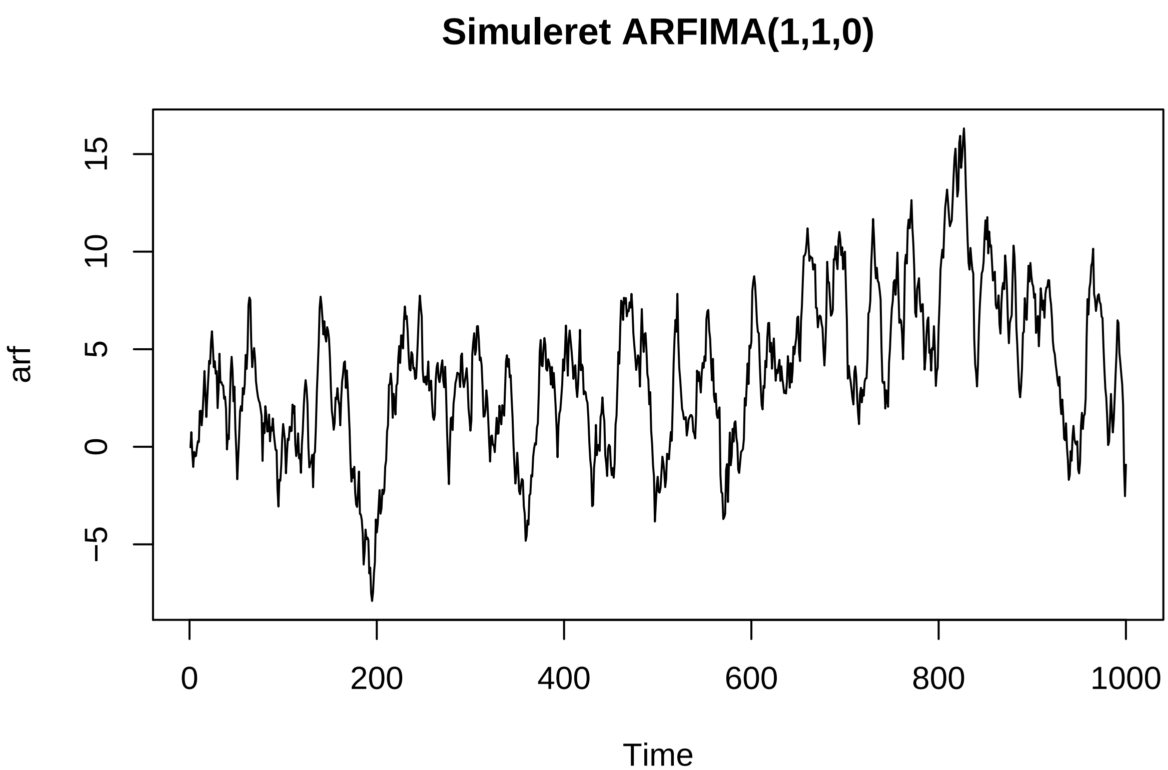
Jonathan Strandberg

13 mar 2019

Opgave 5.1 [ShSt]

Datasættet arf er 1000 simulerede observationer fra en ARFIMA$(1, 1, 0)$ model med $\phi = 0.75$ og $d = 0.4$ a) Plot the data and comment

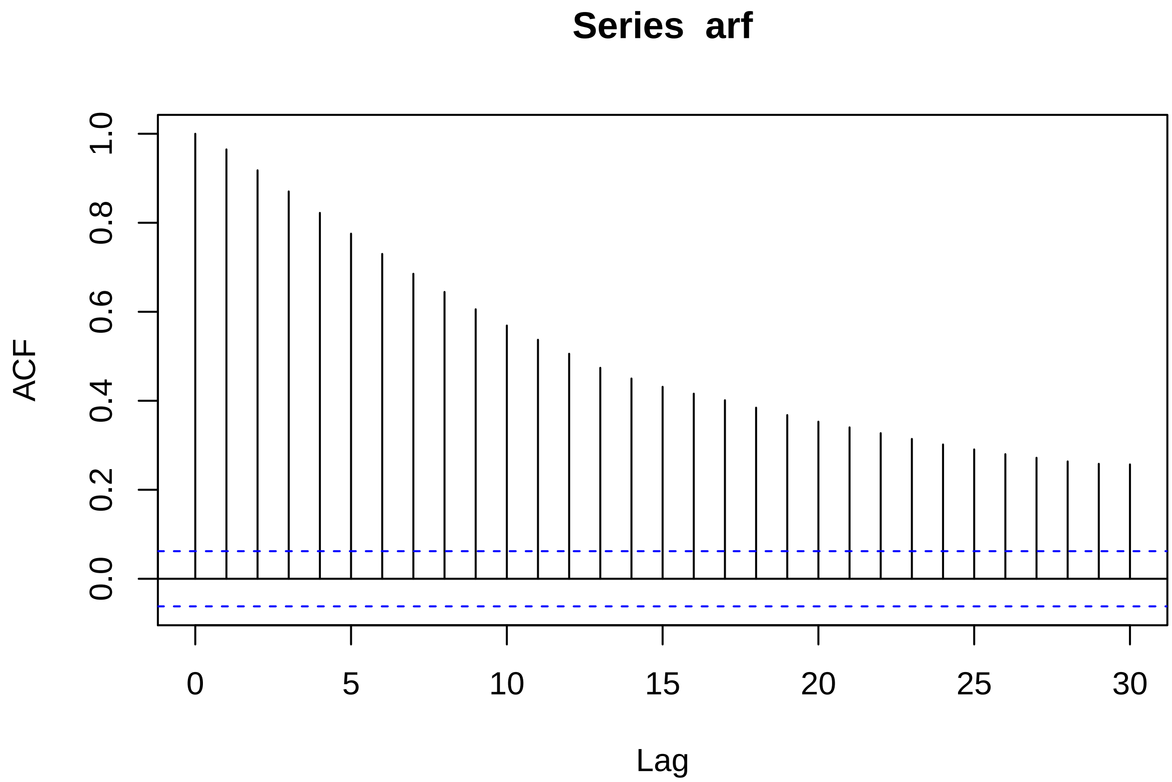
```
plot(arf , main = "Simuleret ARFIMA(1,1,0)")
```

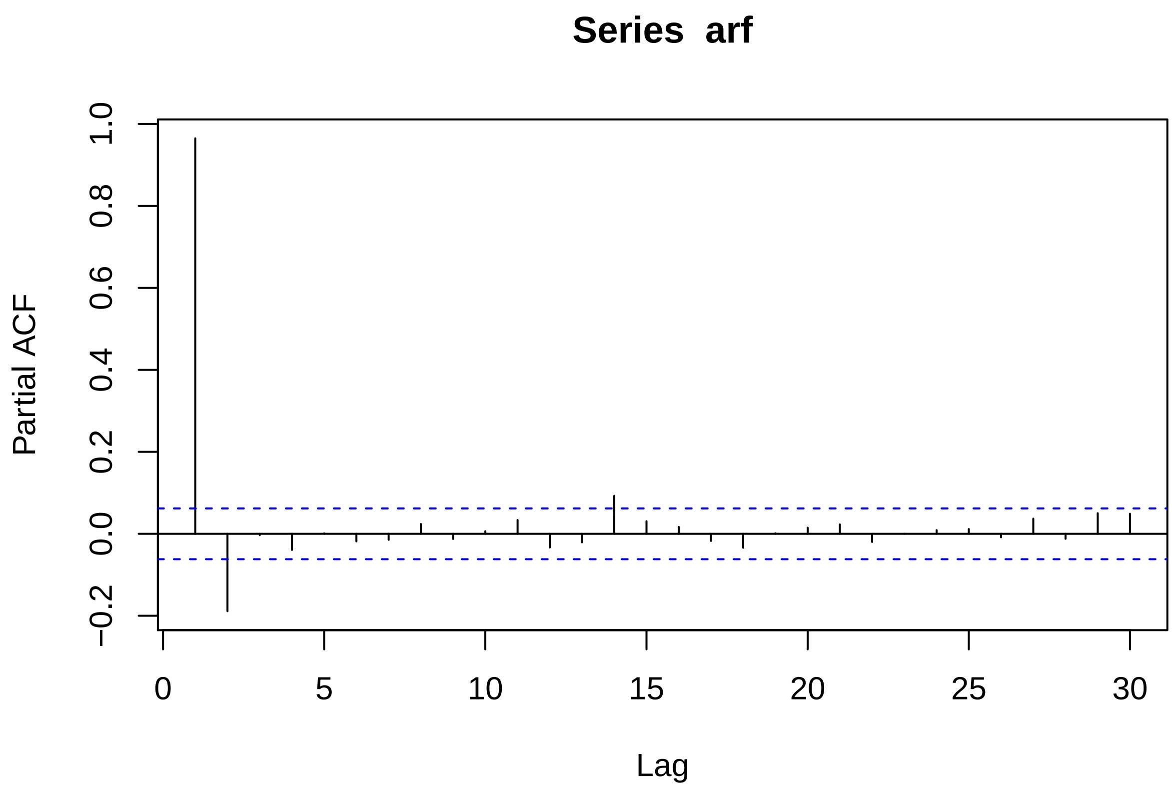


Ser ikke stationært ud

b) Plot the ACF and PACF of the data and comment

```
acf(arf) ; pacf(arf)
```


Series arf
ACF
Lag
0.0
0.2
0.4
0.6
0.8
1.0
0
5
10
15
20
25
30



PACF “cutter off” efter lag 2, og tyder på at det er en AR(2) model

c) Estimate the parameters and test for the significance of the estimates $\widehat{\phi}$ and $\widehat{d}$

```
summary(fracdiff(arf , nar = 1))
```

```
##
## Call:
##   fracdiff(x = arf, nar = 1)
##
## Coefficients:
##    Estimate Std. Error z value Pr(>|z|)
## d  0.264631   0.009653   27.41   <2e-16 ***
## ar 0.863068   0.016921   51.01   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## sigma[eps] = 0.9871988
## [d.tol = 0.0001221, M = 100, h = 1.483e-05]
## Log likelihood: -1406 ==> AIC = 2818.562 [3 deg.freedom]
```

Ses at både $\widehat{\phi}$ and $\widehat{d}$ er meget signifikante

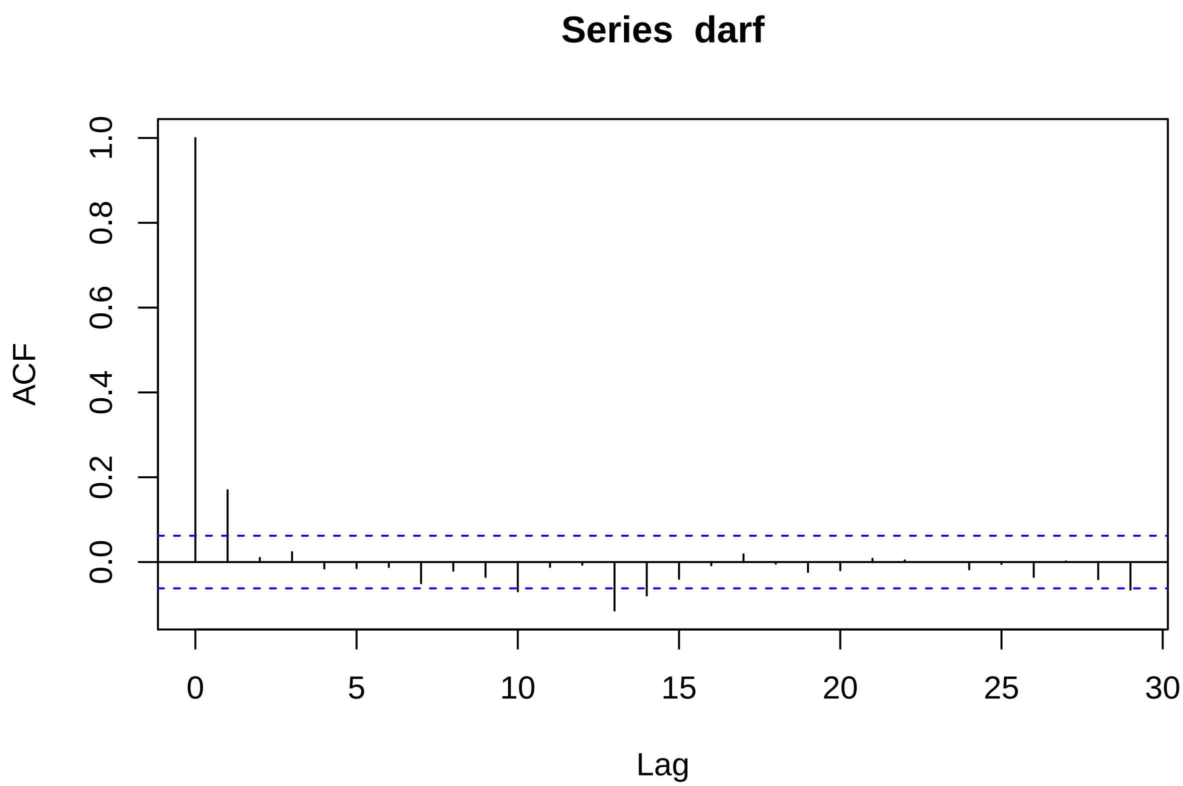
d) Explain why, using the results of parts (a) and (b), it would seem reasonable to difference the data prior to the analysis. That is, if x_t represents the data, explain why we might choose to fit an ARMA model to Δx_t

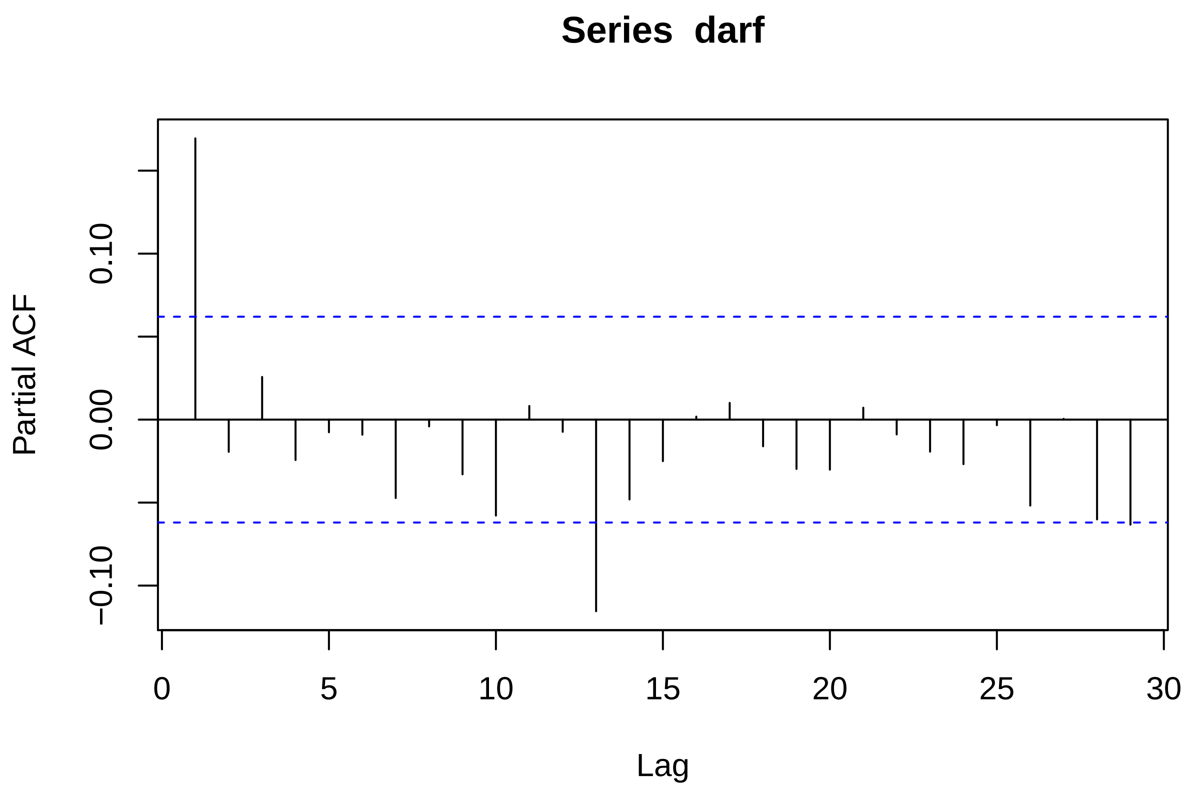
Ser ikke stationær ud så det er rimeligt at diffe

e) Plot the ACF and PACF of Δx_t and comment

```
darf <- diff(arf)

acf(darf) ; pacf(darf)
```





Ved at se på ACF ligner det at Δx_t er stationær

f) Fit an ARMA model to Δx_t and comment

```
auto.arima(darf)
```

```
## Series: darf
## ARIMA(0,0,1) with zero mean
##
## Coefficients:
##          ma1
##       0.1741
## s.e.  0.0314
##
## sigma^2 estimated as 0.9998:  log likelihood=-1416.95
## AIC=2837.9   AICc=2837.91   BIC=2847.71
```

```
sarima(darf , 1 , 0 , 0 , details = FALSE)$ttable
```

```
##       Estimate     SE t.value p.value
## ar1     0.1698 0.0312  5.4424  0.0000
## xmean  -0.0004 0.0381 -0.0104  0.9917
```