Simulando procesos autorregresivos

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Contents

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```
## Warning: package 'forecast' was built under R version 4.1.1

## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo
```

AR(1)

Descripción

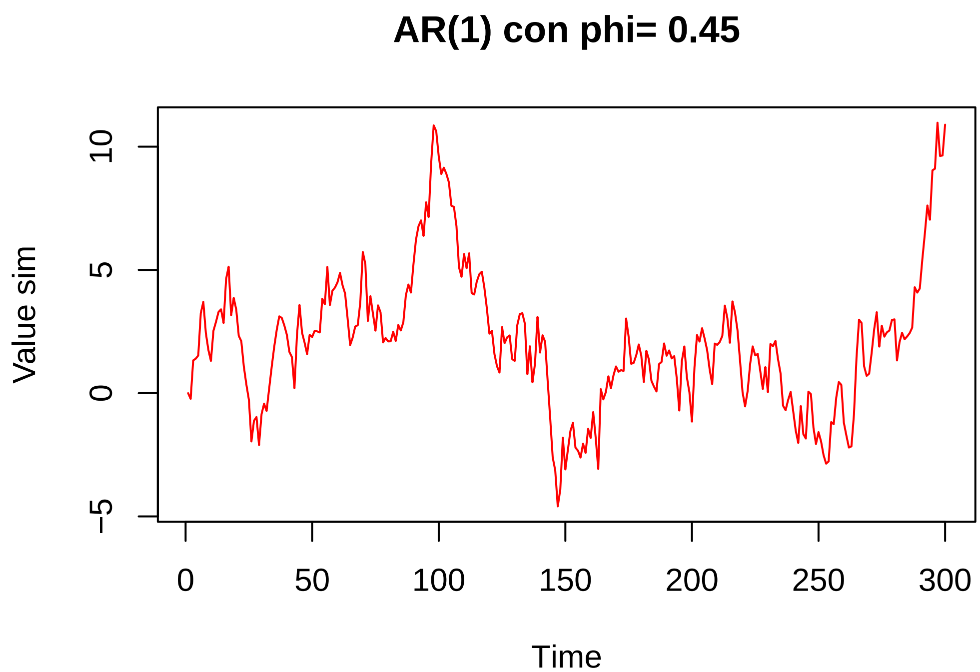
Veamos el proceso:

$$
\begin{aligned}
x_t &= 0.45x_{t-1} + Z_t \\
Z_t &\sim N(0,1) \\
t &= 1, 2, ..., 300
\end{aligned}
$$

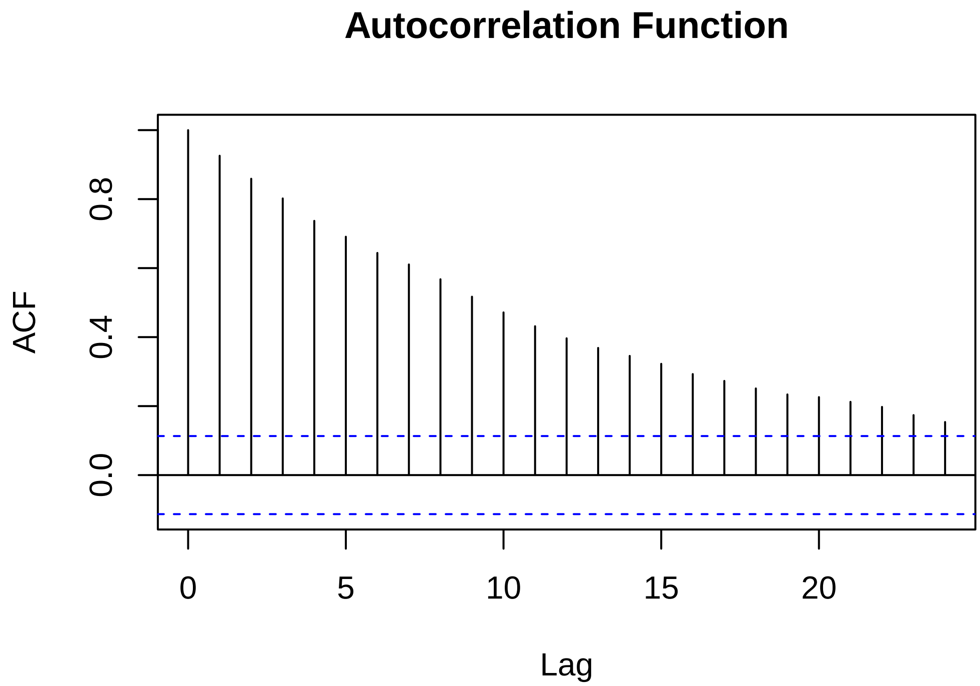
Visualización

Simulando el proceso anterior AR(1) manualmente, viendo el grafico correspondiente y mostrando las primeras 50 observaciones

```
##  [1]  0.0000000 -0.2301775  1.3285308  1.3990392  1.5283270  3.2433919
##  [7]  3.7043081  2.4392469  1.7523941  1.3067321  2.5308139  2.8906277
## [13]  3.2913992  3.4020819  2.8462407  4.6331539  5.1310044  3.1643872
## [19]  3.8657431  3.3929517  2.3251280  2.1071531  1.0811486  0.3522574
## [25] -0.2727819 -1.9594752 -1.1216881 -0.9683150 -2.1064520 -0.8526370
## [31] -0.4261728 -0.7212443  0.1738814  1.0520149  1.8735959  2.5622362
## [37]  3.1161538  3.0542421  2.7482795  2.3678085  1.6731015  1.4651842
## [43]  0.1997879  2.3687438  3.5767058  2.4535972  2.0507124  1.5840570
## [49]  2.3640222  2.2806531
```

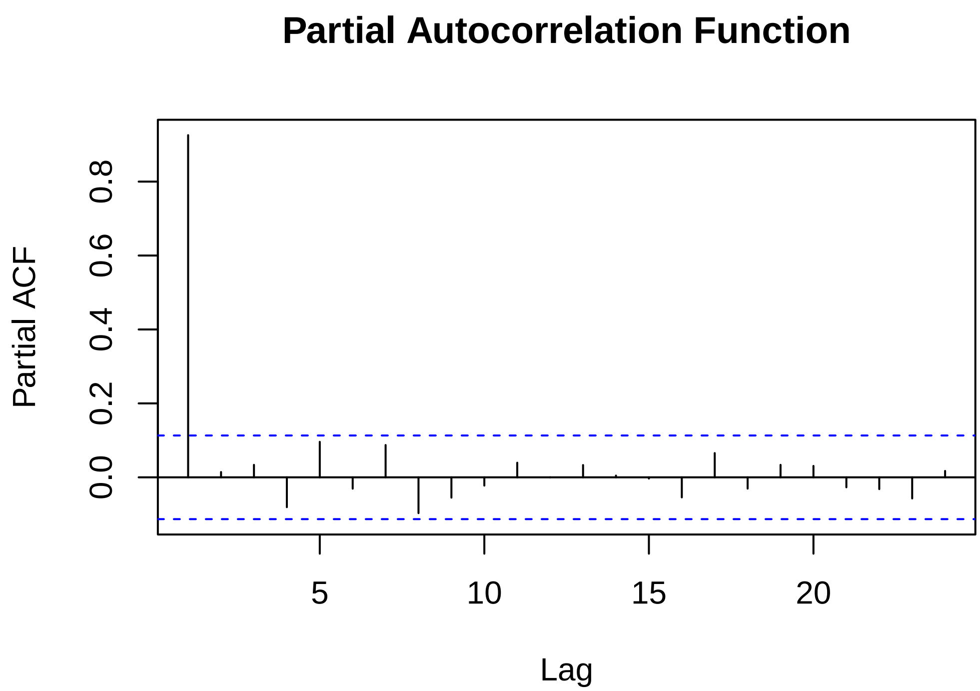


ACF




```
##
## Autocorrelations of series 'ar.1', by lag
##
##     0     1     2     3     4     5     6     7     8     9    10    11    12
## 1.000 0.926 0.859 0.802 0.737 0.691 0.644 0.611 0.568 0.517 0.472 0.432 0.397
##    13    14    15    16    17    18    19    20    21    22    23    24
## 0.369 0.346 0.323 0.293 0.273 0.251 0.234 0.226 0.212 0.198 0.174 0.154
```

PACF




```
##
## Partial autocorrelations of series 'ar.1', by lag
##
##      1      2      3      4      5      6      7      8      9     10     11
##  0.926  0.014  0.034 -0.081  0.096 -0.031  0.087 -0.097 -0.055 -0.023  0.040
##     12     13     14     15     16     17     18     19     20     21     22
##  0.000  0.033  0.005 -0.003 -0.054  0.066 -0.031  0.034  0.031 -0.027 -0.032
##     23     24
## -0.057  0.017
```

AR(2)

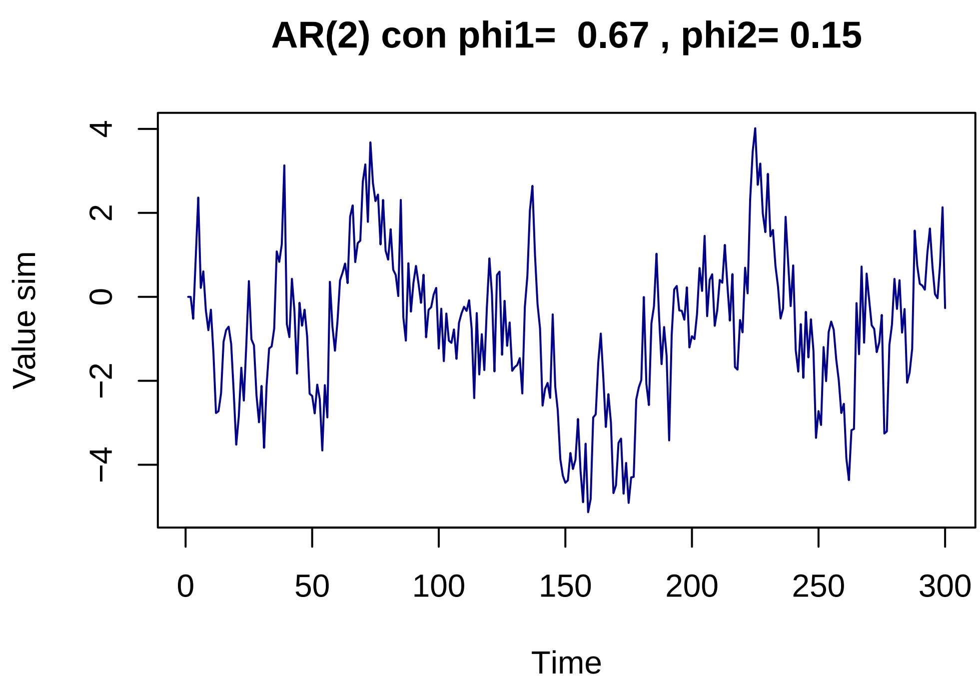
Descripción

$$
\begin{aligned}
x_t &= 0.67x_{t-1} + 0.15X_{t-2} + Z_t \\
Z_t &\sim N(0,1) \\
t &= 1, 2, ..., 300
\end{aligned}
$$

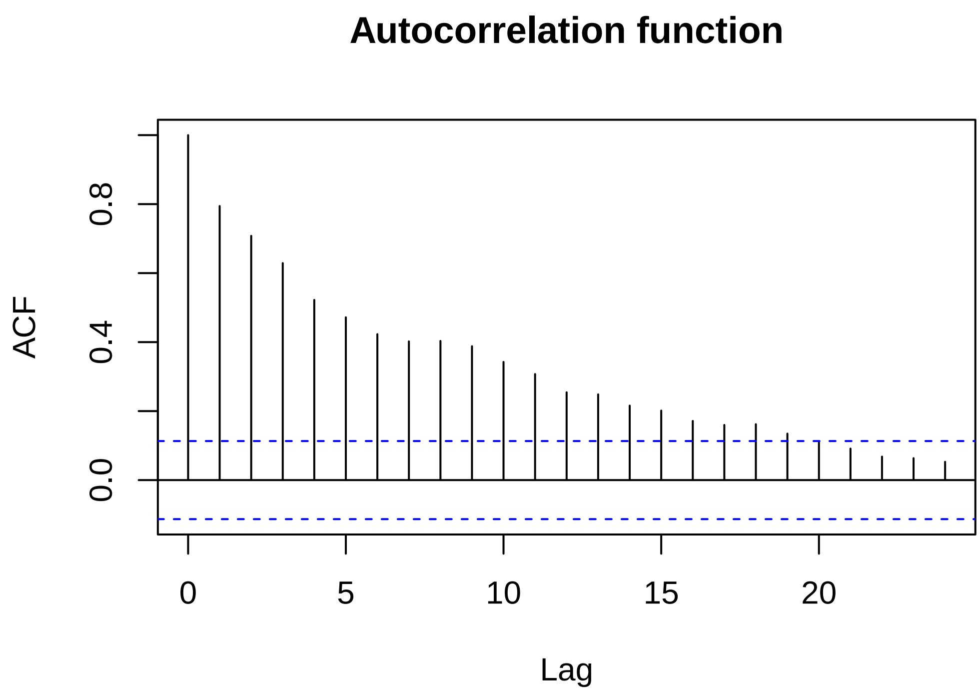
Visualizacion

Simulando el proceso anterior AR(2) manualmente, viendo el grafico correspondiente y mostrando las primeras 50 observaciones

```
##  [1]  0.0000000  0.0000000 -0.5216288  0.9239818  2.3653441  0.2120699
##  [7]  0.6073965 -0.3220301 -0.7945477 -0.3061318 -1.3475625 -2.7681845
## [13] -2.7246078 -2.3000129 -1.0695339 -0.7930767 -0.7113709 -1.1205270
## [19] -2.2667901 -3.5208177 -2.8572806 -1.6880741 -2.4717314 -1.1093400
## [25]  0.3765355 -1.0105242 -1.1547916 -2.3464920 -2.9881067 -2.1220691
## [31] -3.5952048 -2.1122369 -1.2276043 -1.1815206 -0.7597577  1.0834707
## [37]  0.8323126  1.2516487  3.1331525 -0.6474588 -0.9593891  0.4296437
## [43] -0.3360869 -1.8295993 -0.1422474 -0.6873415 -0.3059979 -0.9336294
## [49] -2.3109592 -2.3598715
```

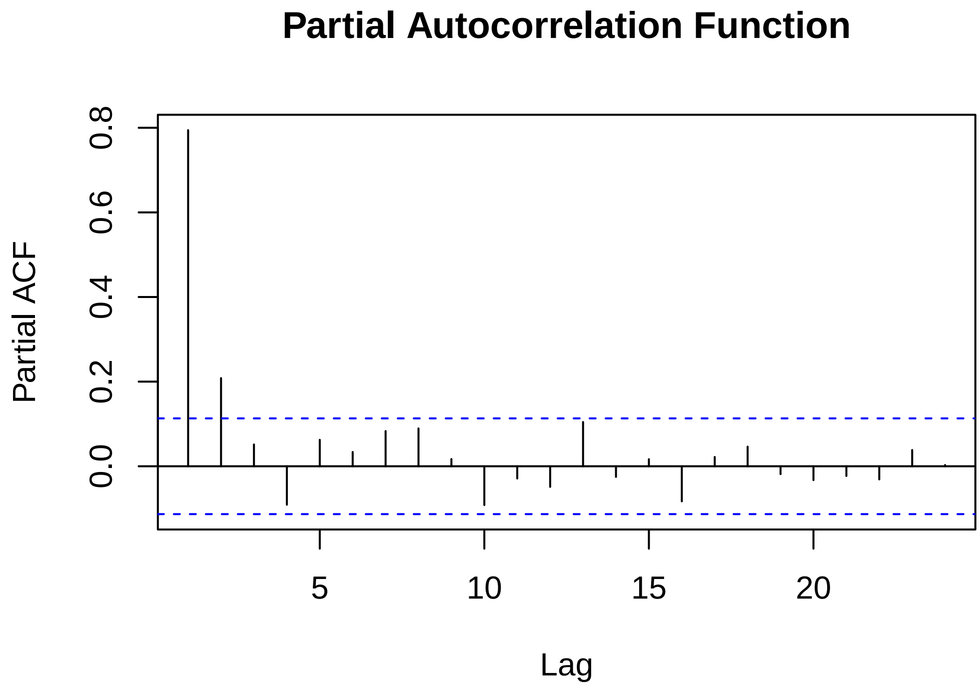


ACF




```
##
## Autocorrelations of series 'ar.2', by lag
##
##     0     1     2     3     4     5     6     7     8     9    10    11    12
## 1.000 0.794 0.708 0.629 0.522 0.472 0.423 0.402 0.403 0.388 0.343 0.307 0.255
##    13    14    15    16    17    18    19    20    21    22    23    24
## 0.249 0.216 0.201 0.172 0.160 0.162 0.135 0.112 0.091 0.068 0.064 0.053
```

PACF




```
##
## Partial autocorrelations of series 'ar.2', by lag
##
##      1      2      3      4      5      6      7      8      9     10     11
##  0.794  0.208  0.052 -0.091  0.063  0.034  0.083  0.090  0.017 -0.092 -0.029
##     12     13     14     15     16     17     18     19     20     21     22
## -0.049  0.105 -0.025  0.017 -0.083  0.022  0.046 -0.019 -0.033 -0.023 -0.031
##     23     24
##  0.038  0.003
```

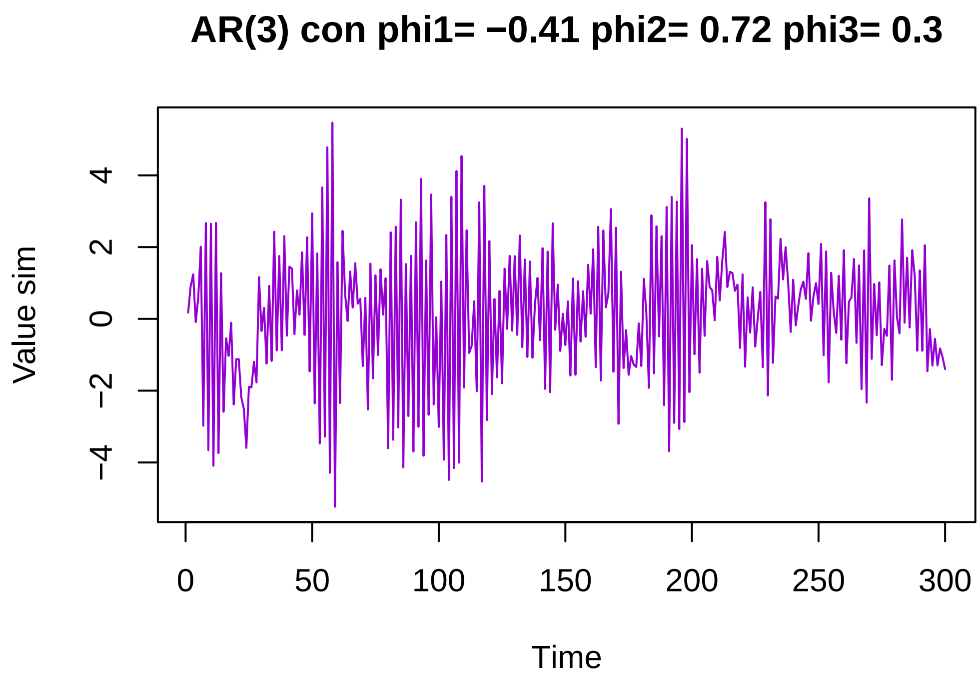
AR(3)

Descripción

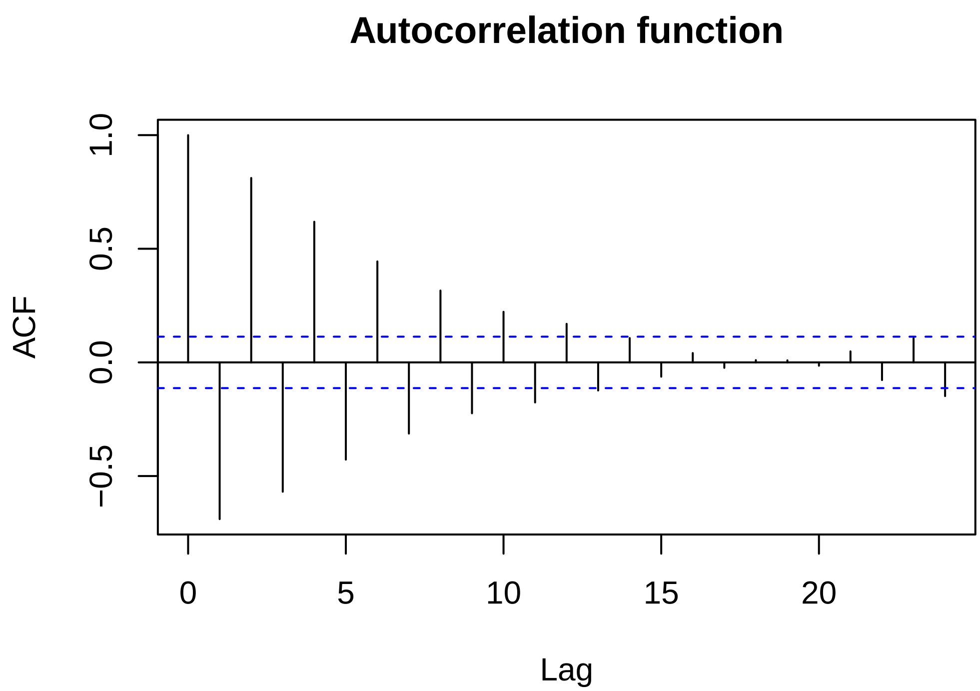
$$
\begin{aligned}
x_t &= -0.41x_{t-1} + 0.72x_{t-2} + 0.3x_{t-3} + Z_t \\
Z_t &\sim N(0,1) \\
t &= 1, 2, ..., 300
\end{aligned}
$$

Visualizacion

Simulando el proceso anterior AR(3) con linea de comando, viendo el grafico correspondiente y mostrando las primeras 50 observaciones

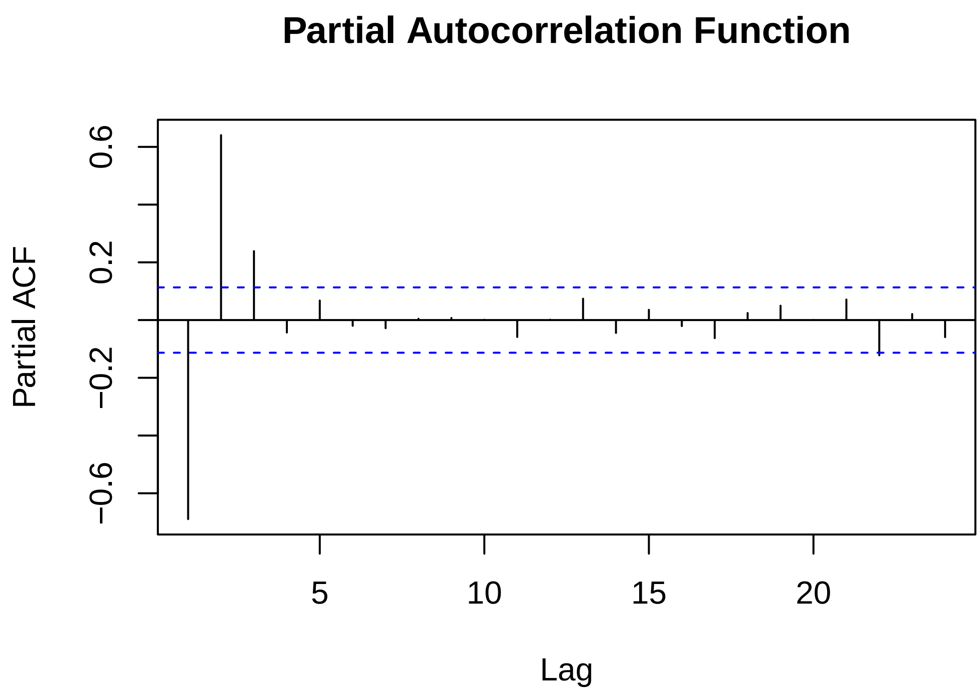


ACF




```
##
## Autocorrelations of series 'ar.3', by lag
##
##      0      1      2      3      4      5      6      7      8      9     10
##  1.000 -0.690  0.812 -0.569  0.619 -0.428  0.444 -0.313  0.316 -0.224  0.223
##     11     12     13     14     15     16     17     18     19     20     21
## -0.176  0.170 -0.124  0.107 -0.063  0.041 -0.024  0.010  0.009 -0.015  0.049
##     22     23     24
## -0.078  0.106 -0.148
```

PACF




```
##
## Partial autocorrelations of series 'ar.3', by lag
##
##      1      2      3      4      5      6      7      8      9     10     11
## -0.690  0.641  0.239 -0.043  0.068 -0.020 -0.028  0.004  0.007  0.001 -0.059
##     12     13     14     15     16     17     18     19     20     21     22
##  0.001  0.074 -0.045  0.036 -0.021 -0.063  0.024  0.050  0.001  0.071 -0.122
##     23     24
##  0.021 -0.059
```