Análisis de la serie de tiempo producción de leche

Contents

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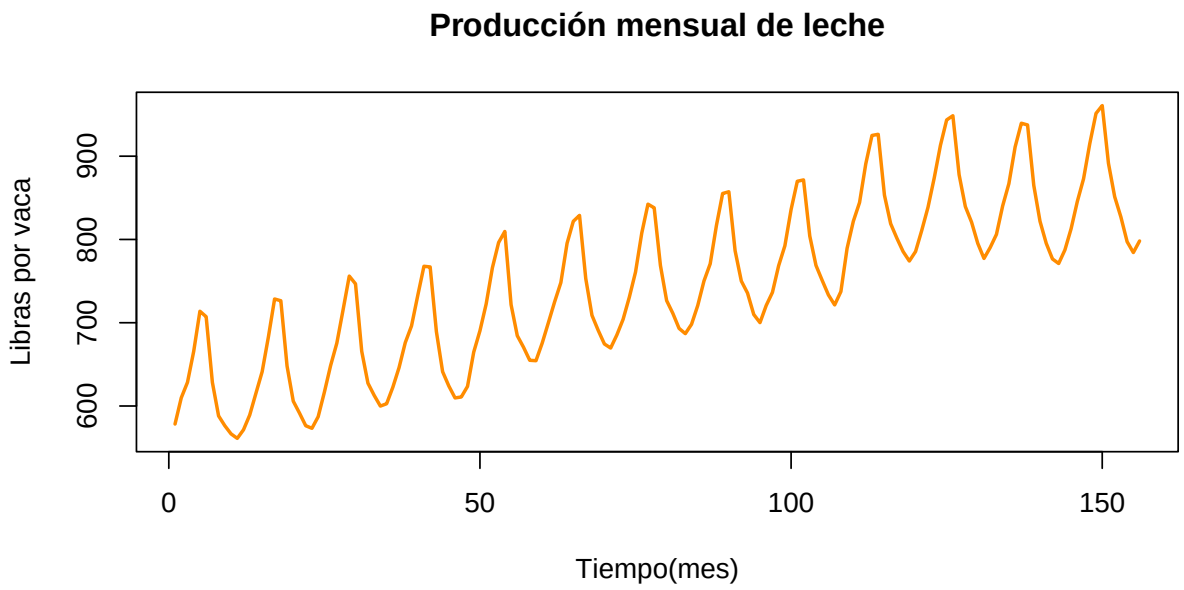
```
## Loading required package: zoo

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric

## Loading required package: MASS

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

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

##
## Attaching package: 'forecast'

## The following object is masked from 'package:astsa':
##
##     gas
```

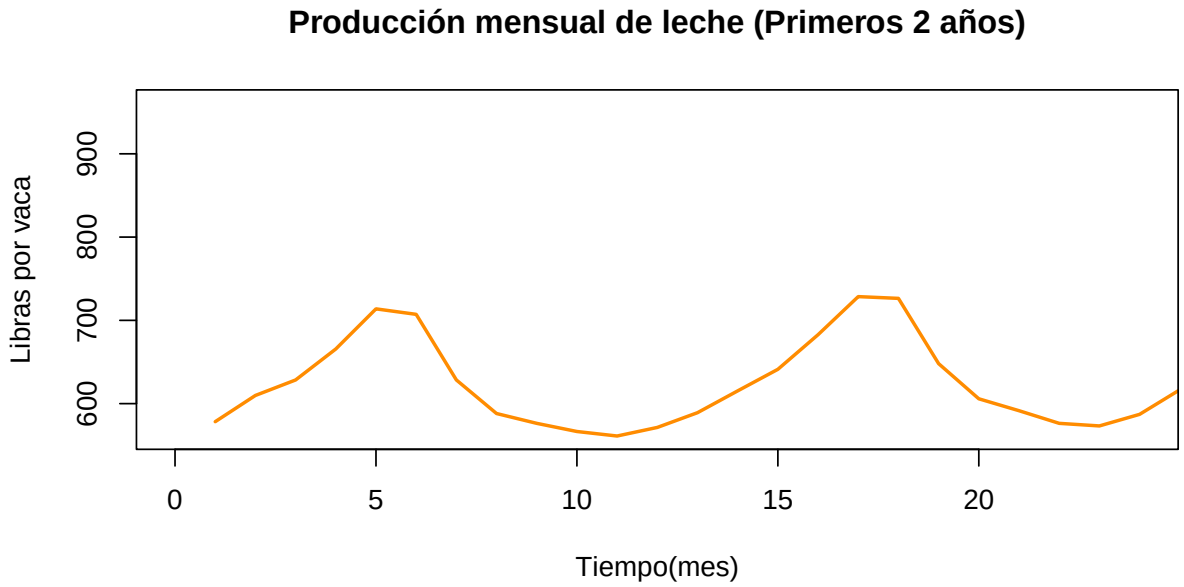
Modelando la serie “milk_production”

Descripción

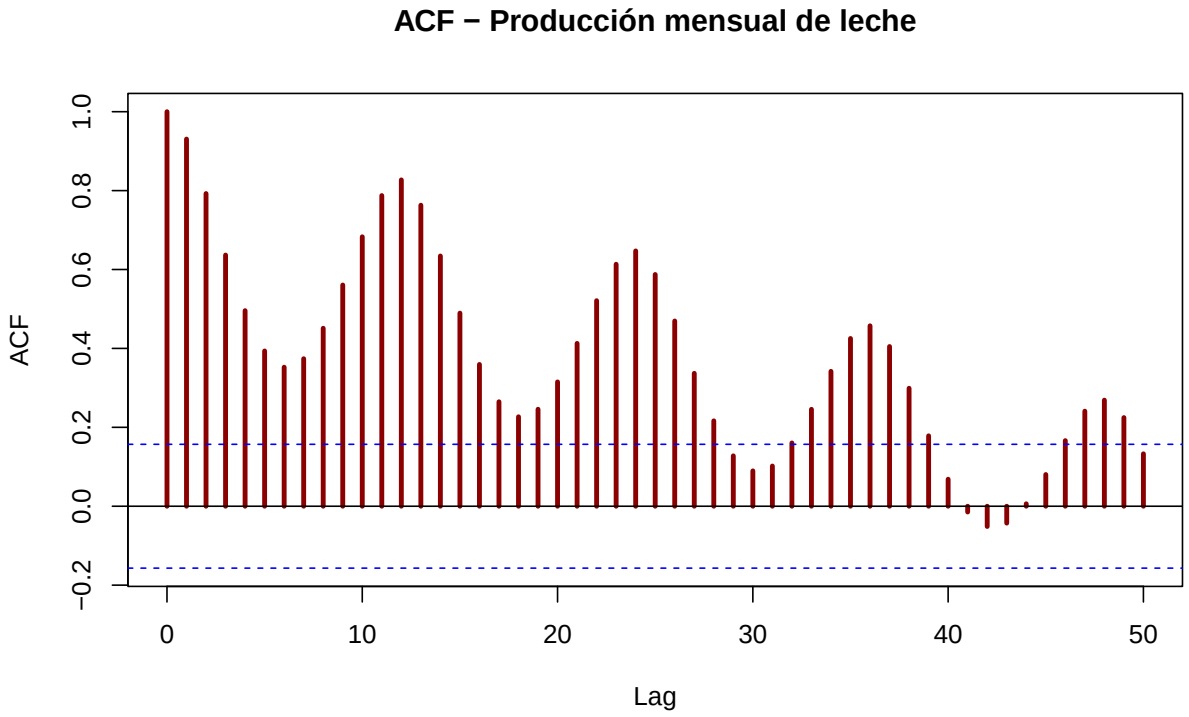
> “Producción de leche mensual: libras por vaca . En el lapso de tiempo de enero de 1962 a diciembre de 1975. Agricultura, Fuente: Cryer (1986)”

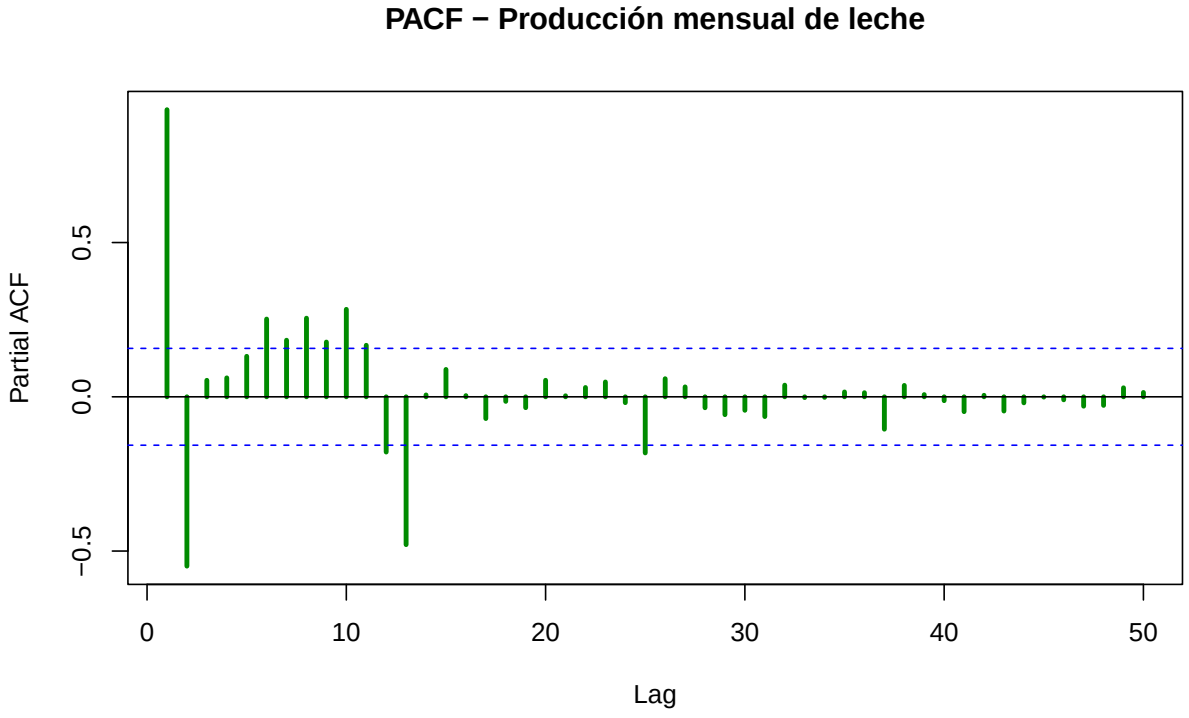
Visualización



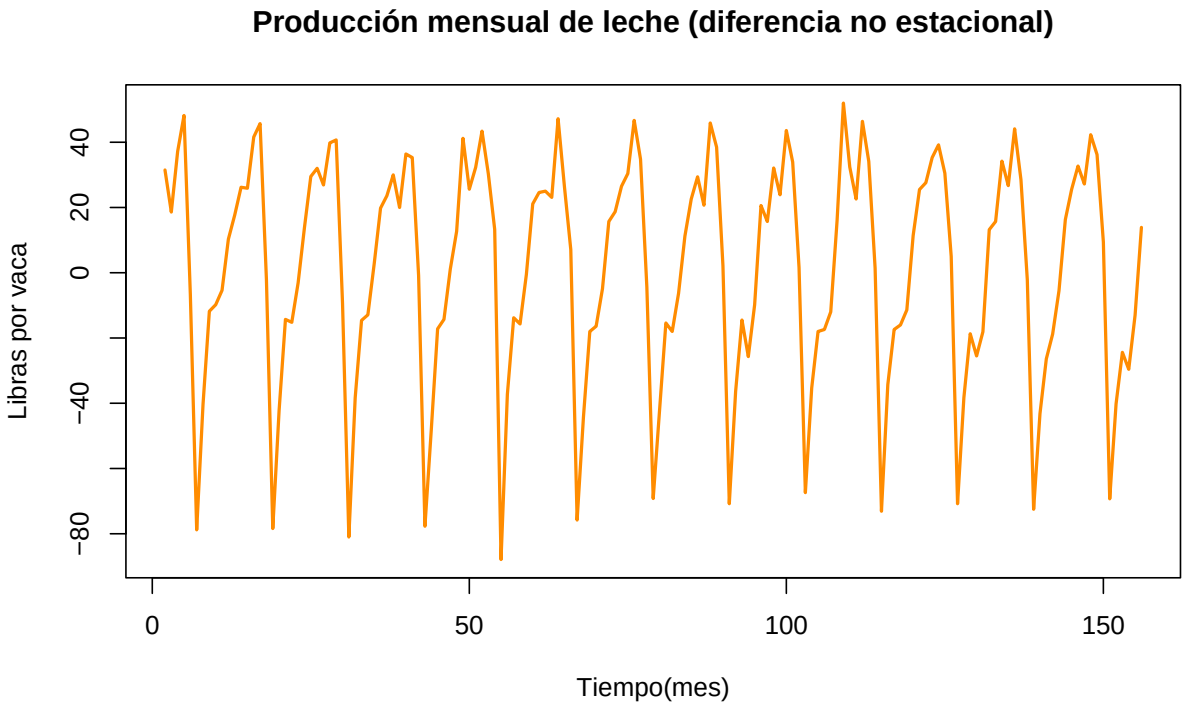


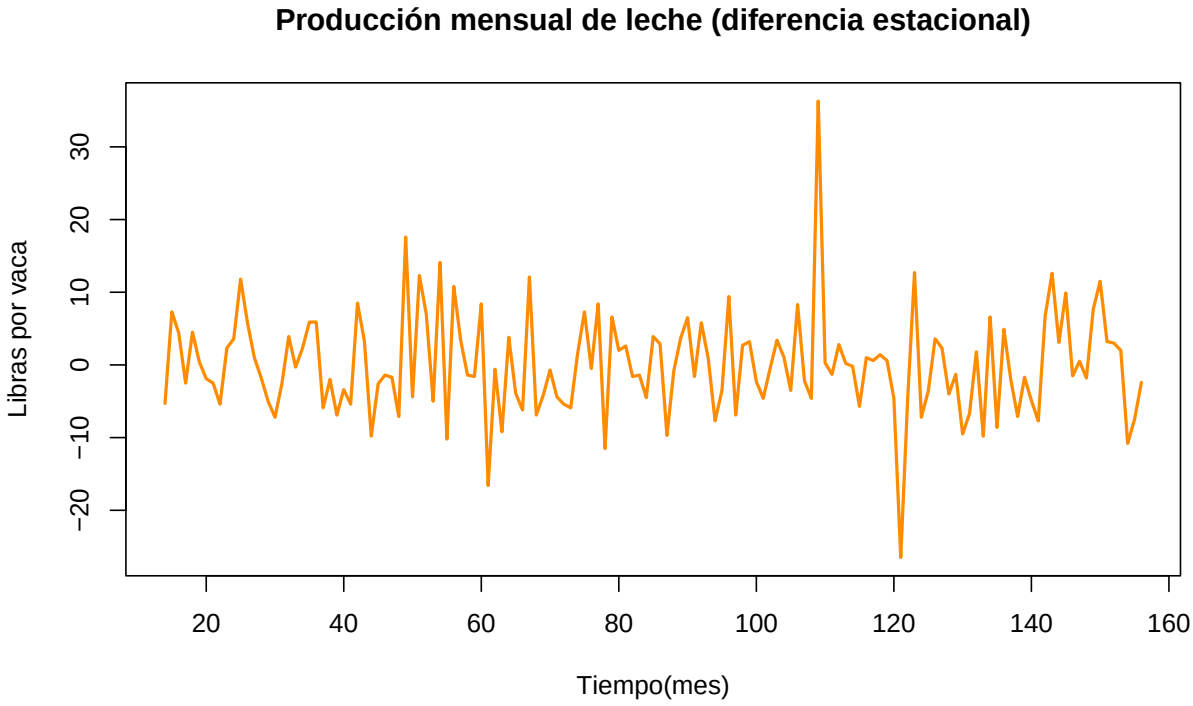
ACF y PACF


ACF − Producción mensual de leche
ACF
1.0
0.8
0.6
0.4
0.2
0.0
−0.2
0
10
20
30
40
50
Lag

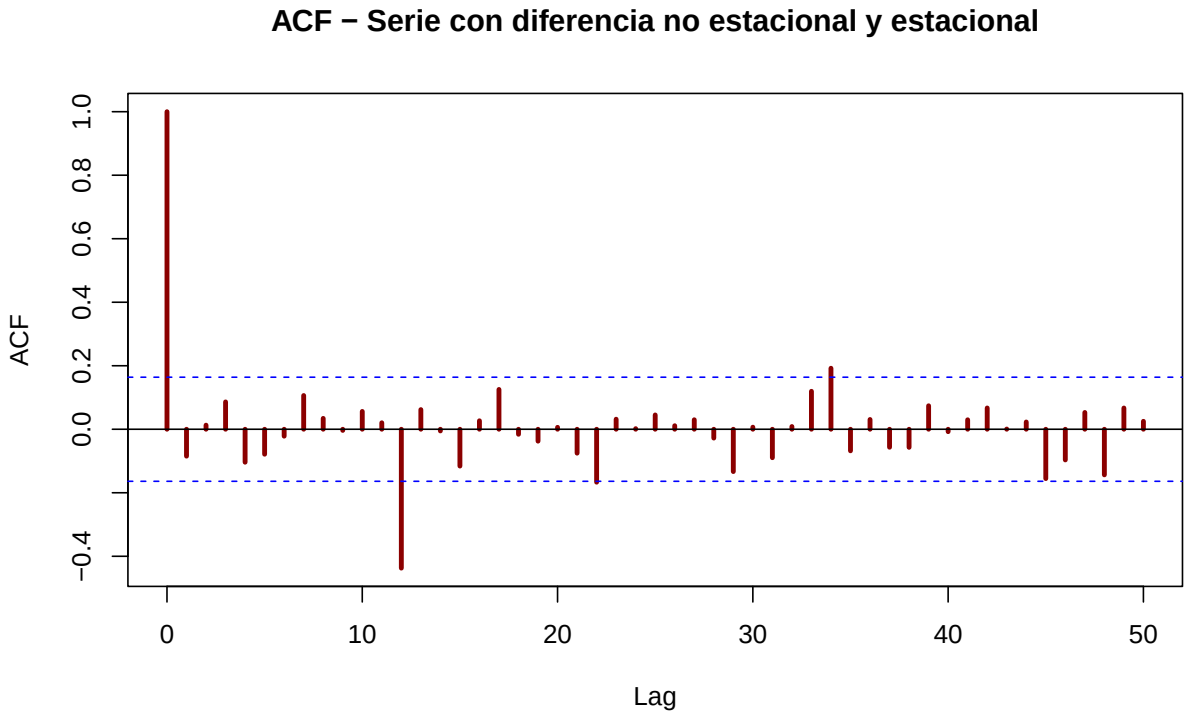

PACF − Producción mensual de leche
Partial ACF
0.5
0.0
−0.5
0
10
20
30
40
50
Lag

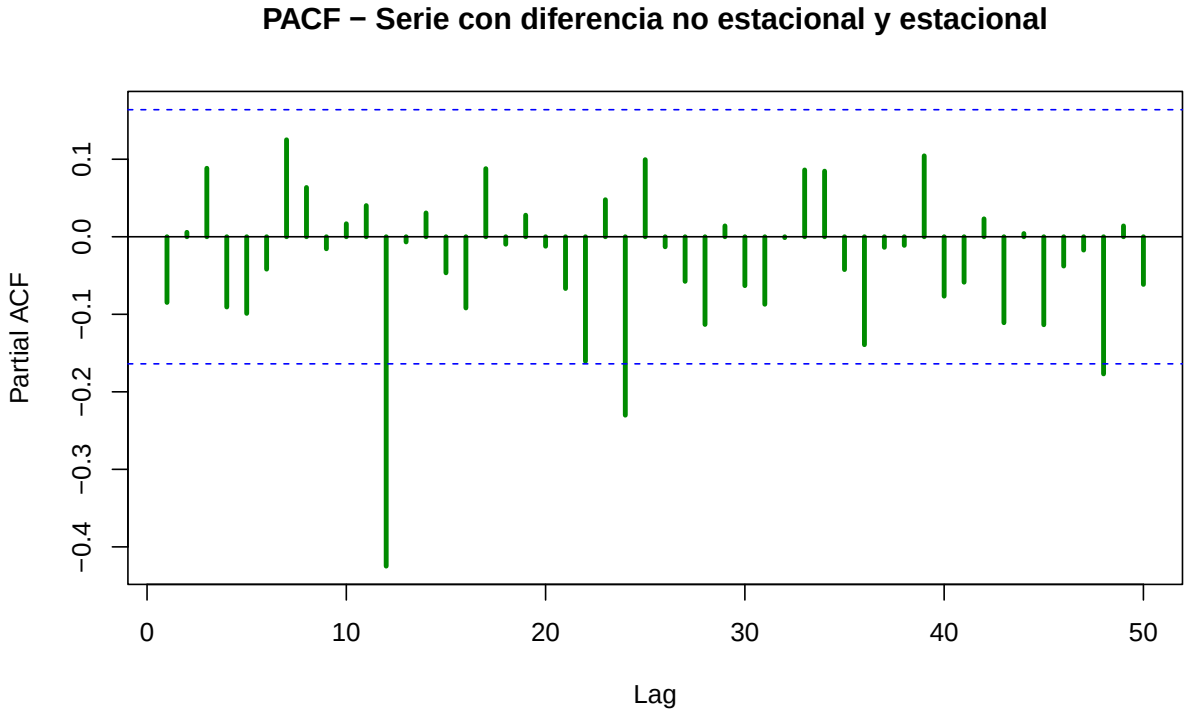
Diferencia no estacional y estacional





ACF y PACF de la diferencia no estacional y estacional





Ajuste por diferentes modelos

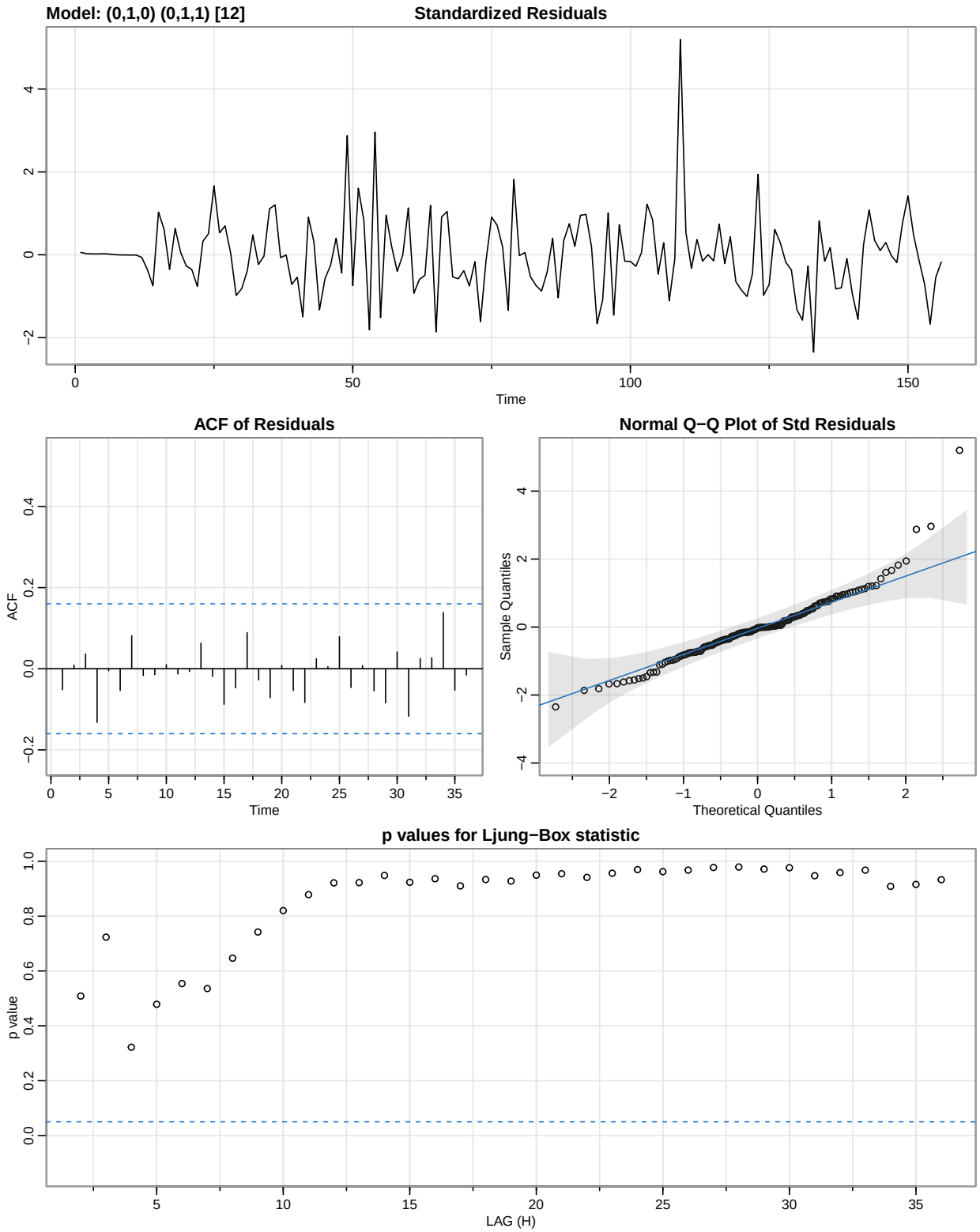
```
## Modelo ( 0 1 0 0 1 0 12 ) AIC= 968.3966  SSE= 7213.013  p-VALUE= 0.4393367
## Modelo ( 0 1 0 0 1 1 12 ) AIC= 923.3288  SSE= 4933.349  p-VALUE= 0.6493728
## Modelo ( 0 1 0 0 1 2 12 ) AIC= 925.3072  SSE= 4931.398  p-VALUE= 0.6529998
## Modelo ( 0 1 0 0 1 3 12 ) AIC= 927.2329  SSE= 4925.911  p-VALUE= 0.6640233
## Modelo ( 0 1 0 1 1 0 12 ) AIC= 938.6402  SSE= 5668.197  p-VALUE= 0.493531
## Modelo ( 0 1 0 1 1 1 12 ) AIC= 925.3063  SSE= 4931.428  p-VALUE= 0.6531856
## Modelo ( 0 1 0 1 1 2 12 ) AIC= 927.3036  SSE= 4931.135  p-VALUE= 0.6537708
## Modelo ( 0 1 0 1 1 3 12 ) AIC= 929.2146  SSE= 4924.747  p-VALUE= 0.6627108
## Modelo ( 0 1 0 2 1 0 12 ) AIC= 932.6438  SSE= 5308.012  p-VALUE= 0.6004804
## Modelo ( 0 1 0 2 1 1 12 ) AIC= 927.2797  SSE= 4929.733  p-VALUE= 0.657349
## Modelo ( 0 1 0 2 1 2 12 ) AIC= 926.8053  SSE= 4618.498  p-VALUE= 0.6826743
```

Selección del modelo

Se propone el modelo final como:

$$x_t = x_{t-1} + x_{t-12} - x_{t-13} + Z_t - 0.675Z_{t-12}$$
$$Z_t \sim N(0, 34.47)$$

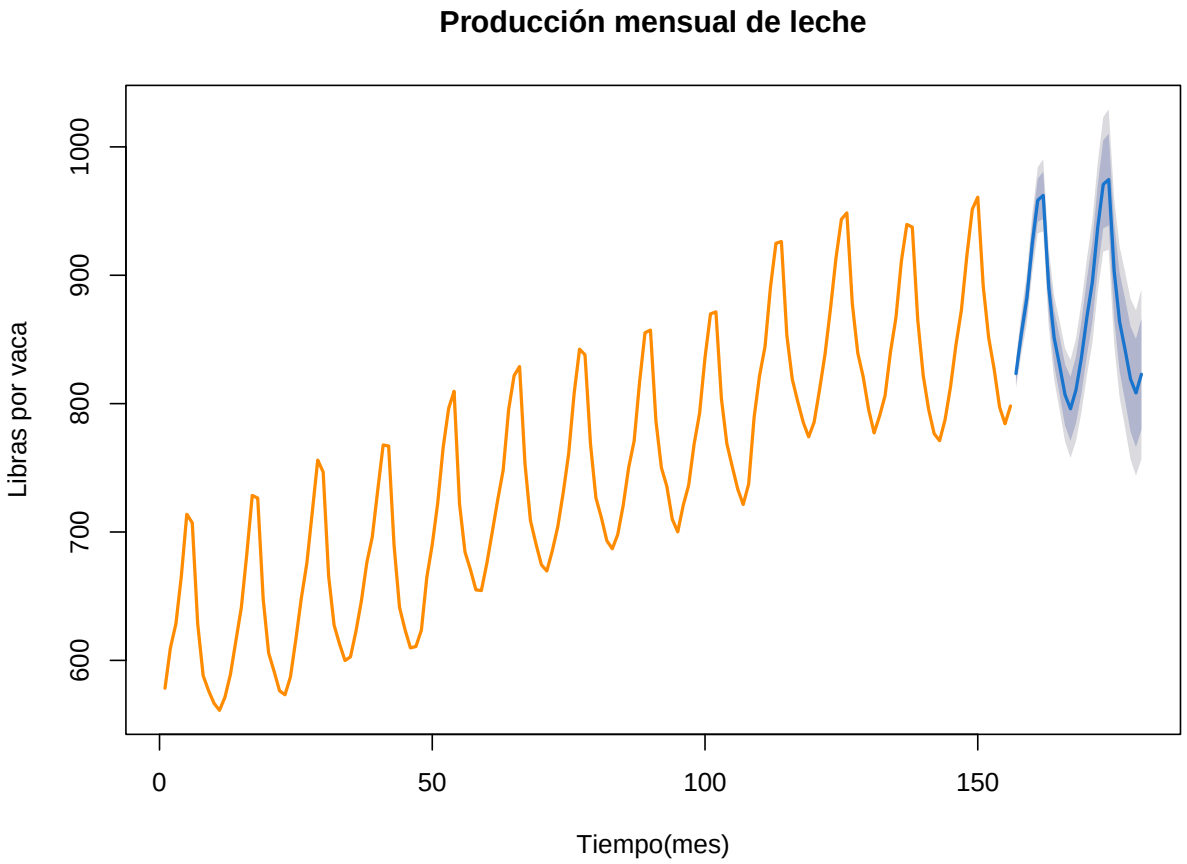
```
## initial  value 1.960071
## iter   2 value 1.820277
## iter   3 value 1.808696
## iter   4 value 1.803385
## iter   5 value 1.802687
## iter   6 value 1.800218
## iter   7 value 1.800130
## iter   8 value 1.800128
## iter   9 value 1.800127
## iter   9 value 1.800127
## iter   9 value 1.800127
## final  value 1.800127
## converged
## initial  value 1.797249
## iter   2 value 1.795522
## iter   3 value 1.795498
## iter   4 value 1.795498
## iter   4 value 1.795498
## final  value 1.795498
## converged
```




```
## $fit
##
## Call:
## arima(x = xdata, order = c(p, d, q), seasonal = list(order = c(P, D, Q), period = S),
```

```
##     include.mean = !no.constant, transform.pars = trans, fixed = fixed, optim.control = list(trace =
##         REPORT = 1, reltol = tol))
##
## Coefficients:
##          sma1
##       -0.6750
## s.e.   0.0752
##
## sigma^2 estimated as 34.47:  log likelihood = -459.66,  aic = 923.33
##
## $degrees_of_freedom
## [1] 142
##
## $ttable
##      Estimate     SE t.value p.value
## sma1   -0.675 0.0752 -8.9785       0
##
## $AIC
## [1] 5.995642
##
## $AICc
## [1] 5.995812
##
## $BIC
## [1] 6.03412
```

Pronóstico



	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
157	823.3978	815.8740	830.9216	811.8911	834.9045
158	854.9196	844.2793	865.5598	838.6467	871.1925
159	882.1923	869.1607	895.2239	862.2622	902.1224
160	925.2390	910.1914	940.2866	902.2257	948.2523
161	958.4461	941.6225	975.2698	932.7165	984.1757
162	962.2105	943.7811	980.6399	934.0252	990.3959
163	890.9973	871.0912	910.9033	860.5536	921.4409
164	851.3336	830.0531	872.6140	818.7879	883.8792
165	829.7513	807.1800	852.3226	795.2314	864.2711
166	806.7802	782.9880	830.5725	770.3931	843.1673