Aula6_2_ThetaR

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1 Método Theta Otimizado em R

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[ ]:
```
# Instale o pacote se necessário
# install.packages('forecTheta')
# Documentação sobre forecTheta: https://cran.r-project.org/web/packages/
 ↪forecTheta/forecTheta.pdf

#################################################################
```

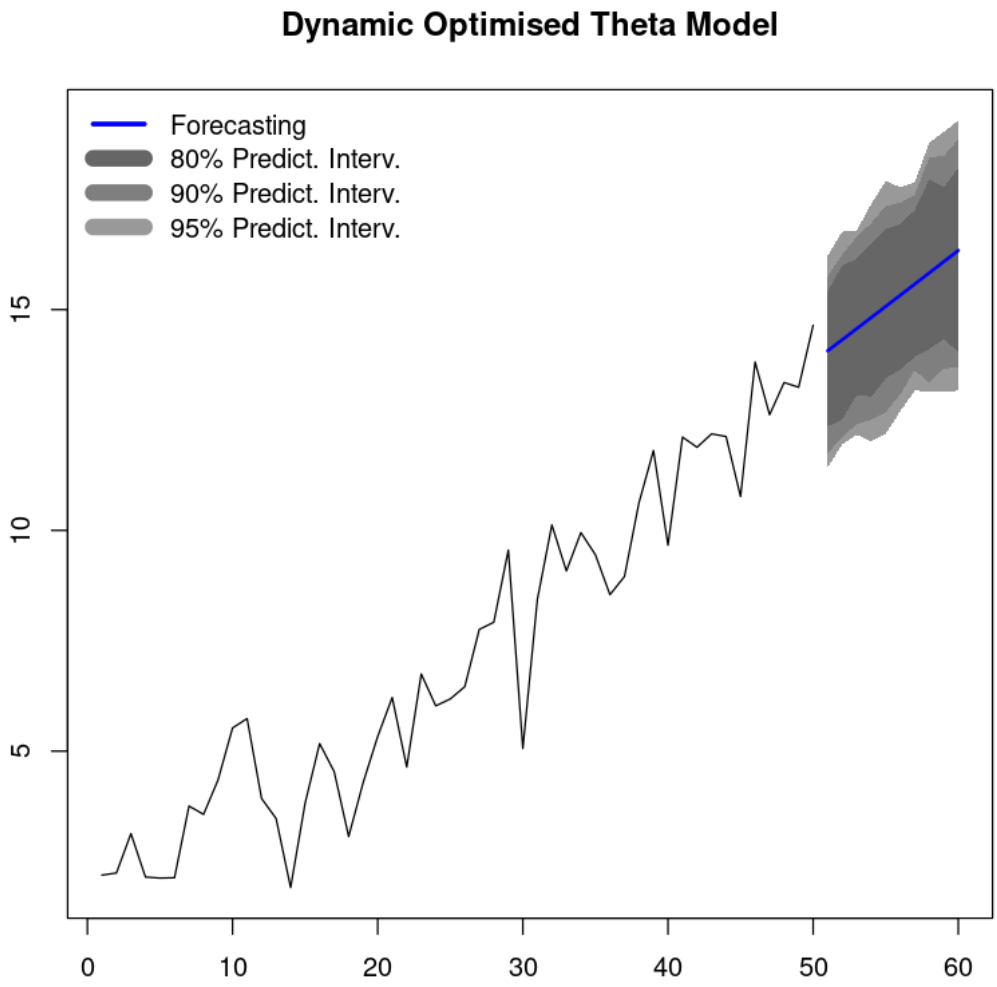
[1]:
```
library(forecTheta)
y1 = 2+ 0.15*(1:20) + rnorm(20)
y2 = y1[20]+ 0.3*(1:30) + rnorm(30)
y =  as.ts(c(y1,y2))

y

out <- dotm(y, h=10)
summary(out)
plot(out)
```

```
Loading required package: parallel

Loading required package: forecast

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

Loading required package: tseries
```

A Time Series:
1. 2.1925462767189 2. 2.24037284744659 3. 3.13294553972621 4. 2.14867192195926 5. 2.12590224757276 6. 2.1329431628575 7. 3.7560848230549 8. 3.5675155142891 9. 4.34754096292323 10. 5.52585879271309 11. 5.73740771238845 12. 3.92857724730147 13. 3.47409015106147 14. 1.91135318218771 15. 3.82344322112615 16. 5.1716198772847 17. 4.53759749288281

18. 3.06704445938449 19. 4.28909782072505 20. 5.33100573540846 21. 6.21471900854439
22. 4.63929129564006 23. 6.74755609097186 24. 6.02573557300975 25. 6.18236149501046
26. 6.46030307668413 27. 7.75730465998751 28. 7.91973238328393 29. 9.55224232743671
30. 5.06090125882115 31. 8.43384669338718 32. 10.1236616889868 33. 9.08068342532007
34. 9.94940700019593 35. 9.44683049418135 36. 8.54311217723983 37. 8.9543649162828
38. 10.6253227754431 39. 11.8089367470311 40. 9.66497491059636 41. 12.1121444729462
42. 11.8815057471994 43. 12.1851359163766 44. 12.1262058941694 45. 10.7672587970467
46. 13.8129769558587 47. 12.6189072079104 48. 13.3481750694266 49. 13.2409326131082
50. 14.6433363105498

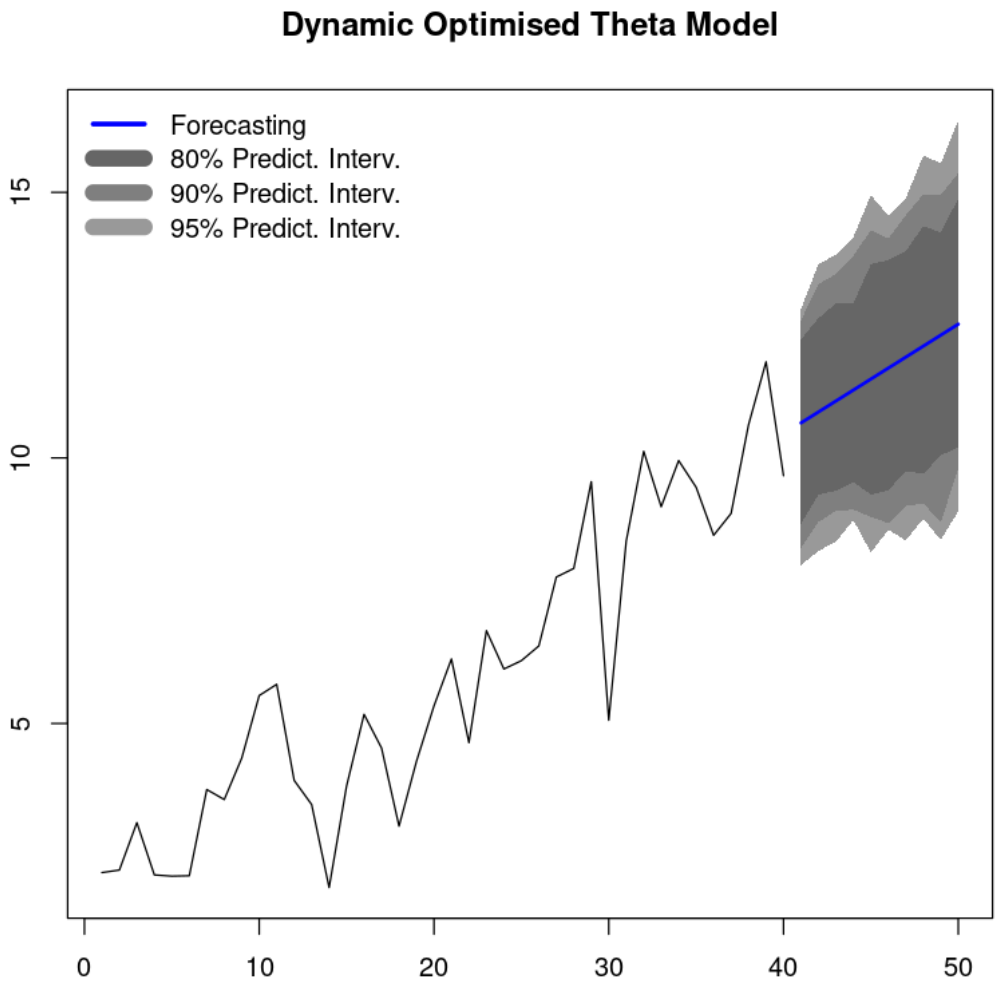
```
Forecast method: Dynamic Optimised Theta Model

Seasonal decomposition: none

Optimisation method: Nelder-Mead

Estimative of parameters:
            MLE
ell0       0.17
alpha      0.24
theta 110316.61

Forecasting points and prediction intervals
Time Series:
Start = 51
End = 60
Frequency = 1
       Mean    Lo 80    Hi 80    Lo 90    Hi 90    Lo 95    Hi 95
51 14.06643 12.35617 15.41245 11.74572 15.74843 11.42562 16.21823
52 14.31655 12.51134 16.00034 12.11546 16.25170 11.94702 16.76355
53 14.56741 13.06137 16.14541 12.40562 16.64547 12.16802 16.78992
54 14.81894 13.02847 16.50388 12.50498 16.95307 12.01722 17.39297
55 15.07109 13.44274 16.82243 12.67314 17.34651 12.18506 17.91512
56 15.32378 13.64155 16.93891 13.07963 17.41700 12.69981 17.76817
57 15.57699 13.93116 17.24533 13.63664 17.59792 13.16302 17.88392
58 15.83065 14.10912 17.94543 13.33760 18.45114 13.15164 18.78080
59 16.08474 14.33103 17.76950 13.66851 18.47181 13.13999 19.02381
60 16.33921 14.04086 18.20061 13.68516 18.85937 13.16390 19.28557

Information Criterions
     Estimative
AIC    168.7378
AICc   169.2595
BIC    174.4739

Warning: According with the Shapiro-Wilk test with 97% of confidence, the unseasoned residuals d
```



[2]:
```
out <- dotm(y=as.ts(y[1:40]), h=10)
summary(out)
plot(out)
```

```
Forecast method: Dynamic Optimised Theta Model

Seasonal decomposition: none

Optimisation method: Nelder-Mead

Estimative of parameters:
        MLE
ell0   0.44
```

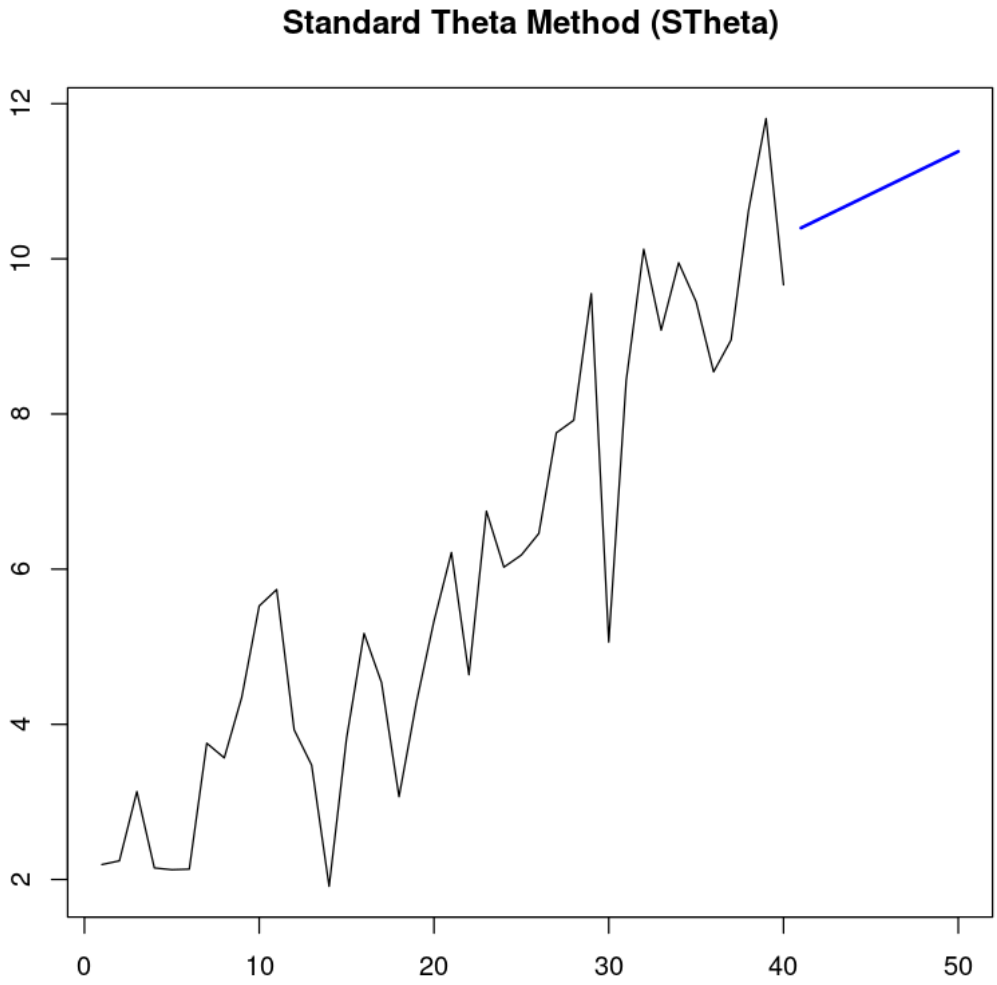
```
alpha  0.25
theta 13.27

Forecasting points and prediction intervals
Time Series:
Start = 41
End = 50
Frequency = 1
       Mean     Lo 80    Hi 80    Lo 90    Hi 90    Lo 95    Hi 95
41 10.65918  8.757126 12.23048 8.303427 12.59018 7.983666 12.80294
42 10.86537  9.311339 12.63080 8.794006 13.27398 8.249145 13.65026
43 11.07179  9.379414 12.90583 9.006603 13.46071 8.424764 13.82480
44 11.27838  9.546957 12.91290 9.024927 13.80730 8.829968 14.15865
45 11.48509  9.307918 13.64572 8.891150 14.28752 8.215876 14.94687
46 11.69186  9.391320 13.72511 8.771892 14.12688 8.647202 14.55861
47 11.89866  9.756046 13.89462 9.093988 14.57114 8.445263 14.89014
48 12.10545  9.701846 14.36484 9.146432 14.96141 8.861674 15.69368
49 12.31219 10.048745 14.24255 8.787568 14.95109 8.452578 15.54803
50 12.51886 10.202892 14.88538 9.810667 15.36117 8.998068 16.35526

Information Criterions
     Estimative
AIC    140.6879
AICc   141.3546
BIC    145.7546
```



[3]:
```
out2 <- stheta(y=as.ts(y[1:40]), h=10)
summary(out2)
plot(out2)
```

```
Forecast method: Standard Theta Method (STheta)

Seasonal decomposition: none

Optimisation method: Nelder-Mead

Estimative of parameters:
        MLE
ell0^* 2.95
```

```
alpha  0.33

Forecasting points and prediction intervals
Time Series:
Start = 41
End = 50
Frequency = 1
 [1] 10.39814 10.50773 10.61733 10.72692 10.83652 10.94612 11.05571 11.16531
 [9] 11.27490 11.38450

Information Criterions
     Estimative
AIC    135.2523
AICc   135.5767
BIC    138.6301
```



[4]:
```
# Métricas para comparar as duas previsões
# Referências

# https://en.wikipedia.org/wiki/Mean_absolute_percentage_error
# https://en.wikipedia.org/wiki/Mean_absolute_scaled_error


### sMAPE metric
errorMetric(obs=as.ts(y[41:50]), forec=out$mean, type = "sAPE", statistic = "M")
errorMetric(obs=as.ts(y[41:50]), forec=out2$mean, type = "sAPE", statistic = "M")

### sMdAPE metric
errorMetric(obs=as.ts(y[41:50]), forec=out$mean, type = "sAPE", statistic = "Md")
errorMetric(obs=as.ts(y[41:50]), forec=out2$mean, type = "sAPE", statistic =␣
 ↪"Md")

### MASE metric
meanDiff1 = mean(abs(diff(as.ts(y[1:40]), lag = 1)))
errorMetric(obs=as.ts(y[41:50]), forec=out$mean, type = "AE", statistic = "M") /␣
 ↪meanDiff1
errorMetric(obs=as.ts(y[41:50]), forec=out2$mean, type = "AE", statistic = "M") /
 ↪ meanDiff1
```

10.015161349123

14.9391941675881

9.25430659442794

14.489925101553

1.07697510207412

1.57459583840274

[ ]:
```

```