Equações em diferenças no R

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Contents

Equações em diferença de ordem 1 - caso homogêneo

Neste exercício quremos analisar a dinâmica resultante de uma equação em diferenças de ordem um, analisando valores diversos para o coeficiente a_0.

Para a análise gráfica das simulações a realizar, precisamos dos pacotes `ggplot2` e `tidiverse`.

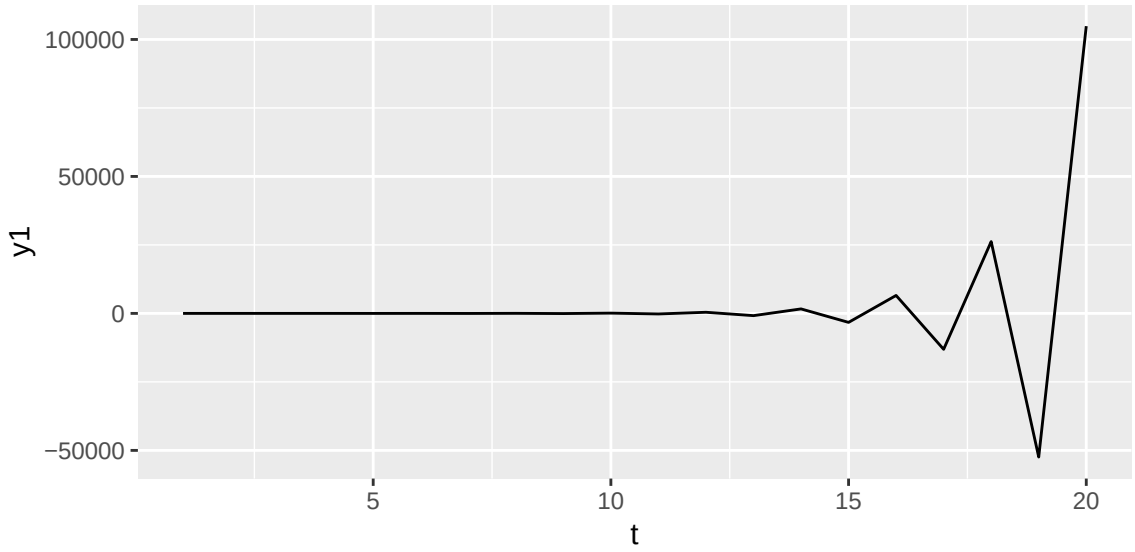
```
library(ggplot2)
library(tidyr)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

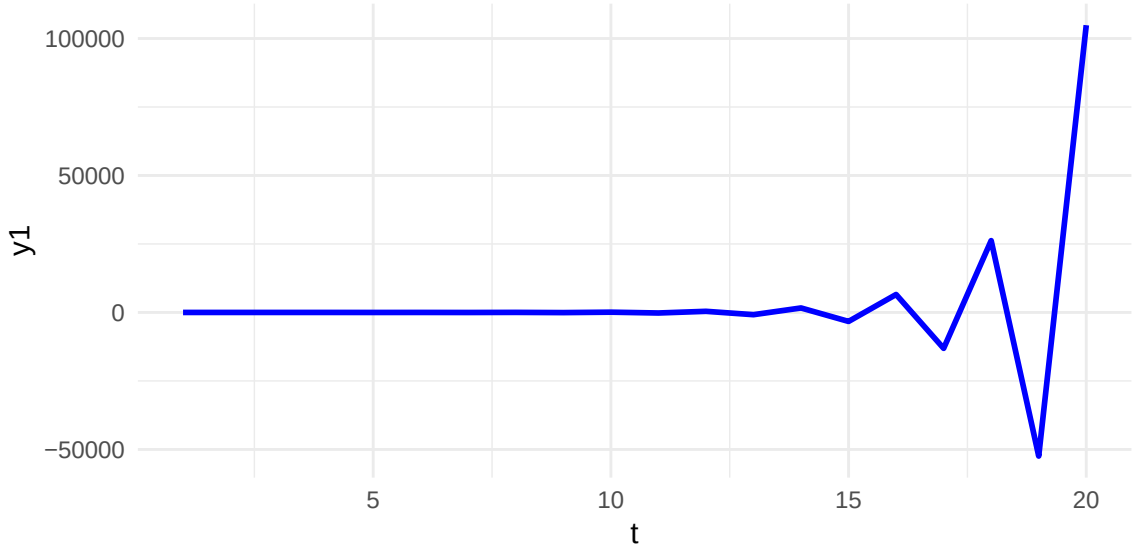
```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

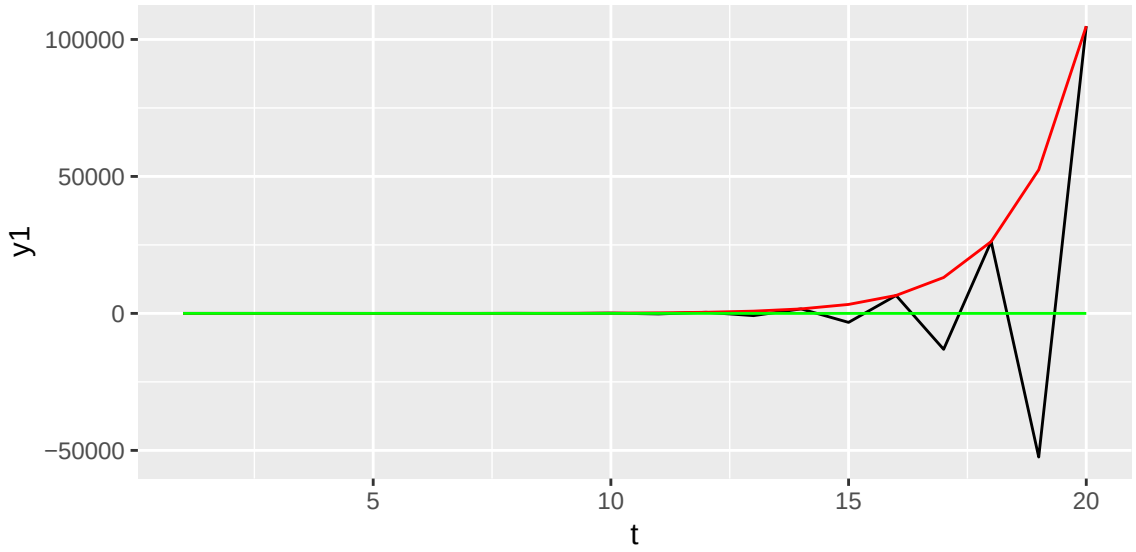
```
# diferentes coeficientes para a equacao linear
a0 <- c(2, -2, 1/3, -1/3, 1, -1)


iter <- 20 # numero de iteracoes - periodos de tempo

t <- 1:iter # vetor simulando os diferenes periodos de tempo

y0 <- 0.1 # condicao inicial

# produzindo seis series de tempo diferentes
y1 <- (-a0[1])^t * y0

y2 <- (-a0[2])^t * y0

y3 <- (-a0[3])^t * y0

y4 <- (-a0[4])^t * y0

y5 <- (-a0[5])^t * y0

y6 <- (-a0[6])^t * y0

# armazenando as series temporais em um dataframe
series <- data.frame(t, y1, y2, y3, y4, y5, y6)

# grafico basico
ggplot( data = series, mapping = aes(x = t, y = y1)  ) +

  geom_line(  )
```




```
# aprimorando a estetica
ggplot( data = series, aes(x = t, y = y1)  ) +

  geom_line( col = "blue", size = 1  ) +

  theme_minimal()
```




```
# a forma preguicosa de visualizar varias series
ggplot( data = series, aes(x = t, y = y1)  ) +

  geom_line( ) +

  geom_line( aes(y = y2), col = "red"  ) +

  geom_line( aes(y = y3), col="green"  )
```



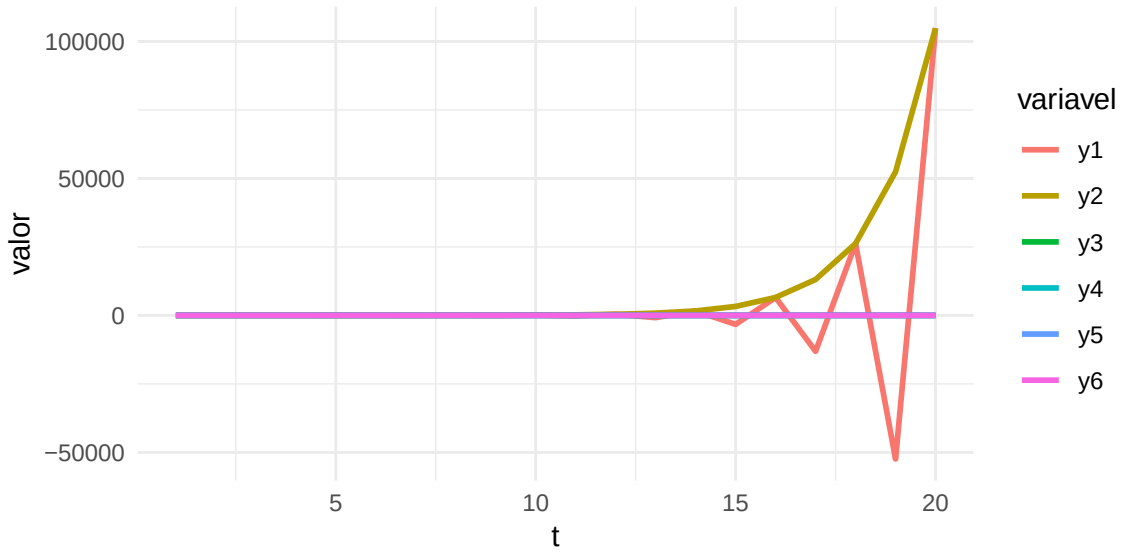

```
# a forma mais eficiente
# gather = juntar, agregar, arrumar, arranjar, reordenar
series_gathered <- series %>% gather(key = "variavel", value = "valor", -t)

head(series)
```

```
##   t   y1  y2            y3           y4   y5  y6
## 1 1 -0.2 0.2 -0.0333333333 0.0333333333 -0.1 0.1
## 2 2  0.4 0.4  0.0111111111 0.0111111111  0.1 0.1
## 3 3 -0.8 0.8 -0.0037037037 0.0037037037 -0.1 0.1
## 4 4  1.6 1.6  0.0012345679 0.0012345679  0.1 0.1
## 5 5 -3.2 3.2 -0.0004115226 0.0004115226 -0.1 0.1
## 6 6  6.4 6.4  0.0001371742 0.0001371742  0.1 0.1
```

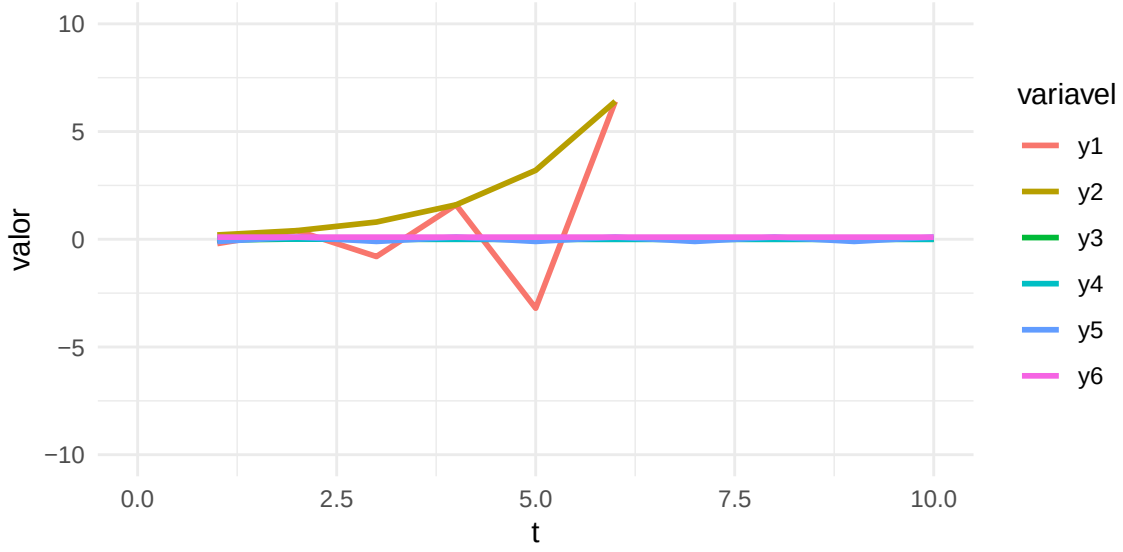
```
head(series_gathered)
```

```
##   t variavel valor
## 1 1       y1  -0.2
## 2 2       y1   0.4
## 3 3       y1  -0.8
## 4 4       y1   1.6
## 5 5       y1  -3.2
## 6 6       y1   6.4
```

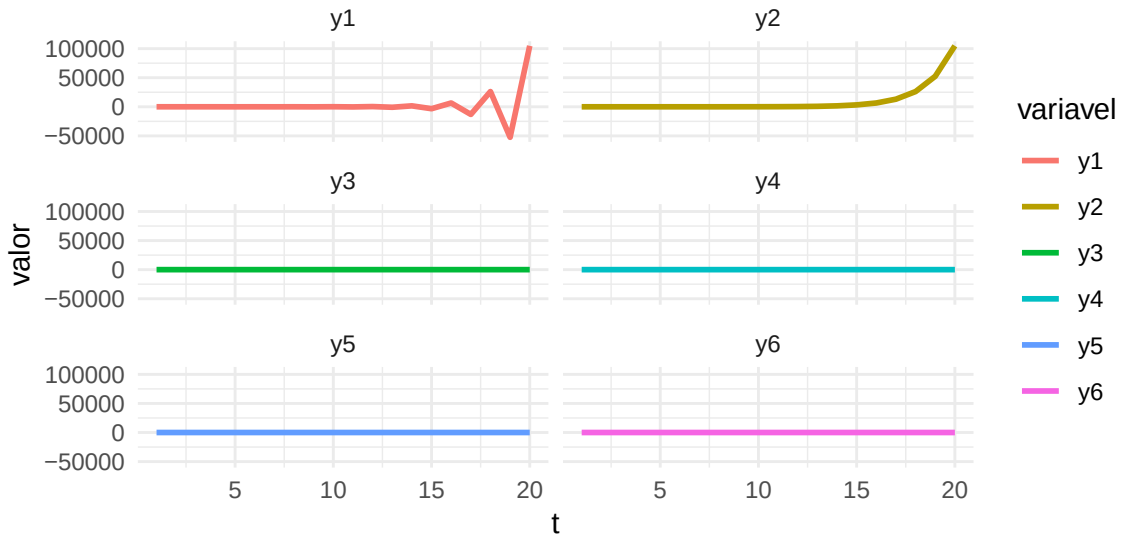
```
ggplot(series_gathered, aes(x = t, y = valor, color = variavel)) +

  geom_line(  size = 1 ) +

  theme_minimal()
```



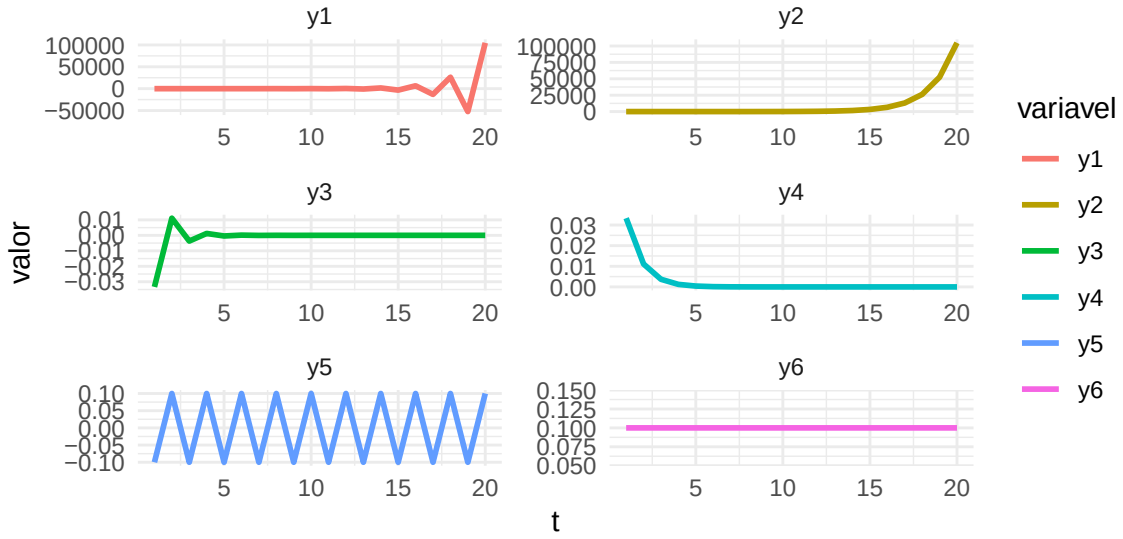

```
ggplot(series_gathered, aes(x = t, y = valor, color = variavel)) +
  geom_line(  size = 1 ) +
  theme_minimal() +
  ylim(-10,10) +
  xlim(0,10)
```




```
ggplot(series_gathered, aes(x = t, y = valor, color = variavel)) +
  geom_line(  size = 1 ) +
  facet_wrap( ~variavel, ncol = 2) +
  theme_minimal()
```




```
# adicionamos o scale free
grafico <- ggplot(series_gathered, aes(x = t, y = valor, color = variavel)) +

  geom_line(  size = 1 ) +

  facet_wrap( ~variavel, ncol = 2, scales = "free") +

  theme_minimal()


grafico
```



Para salvar o gráfico

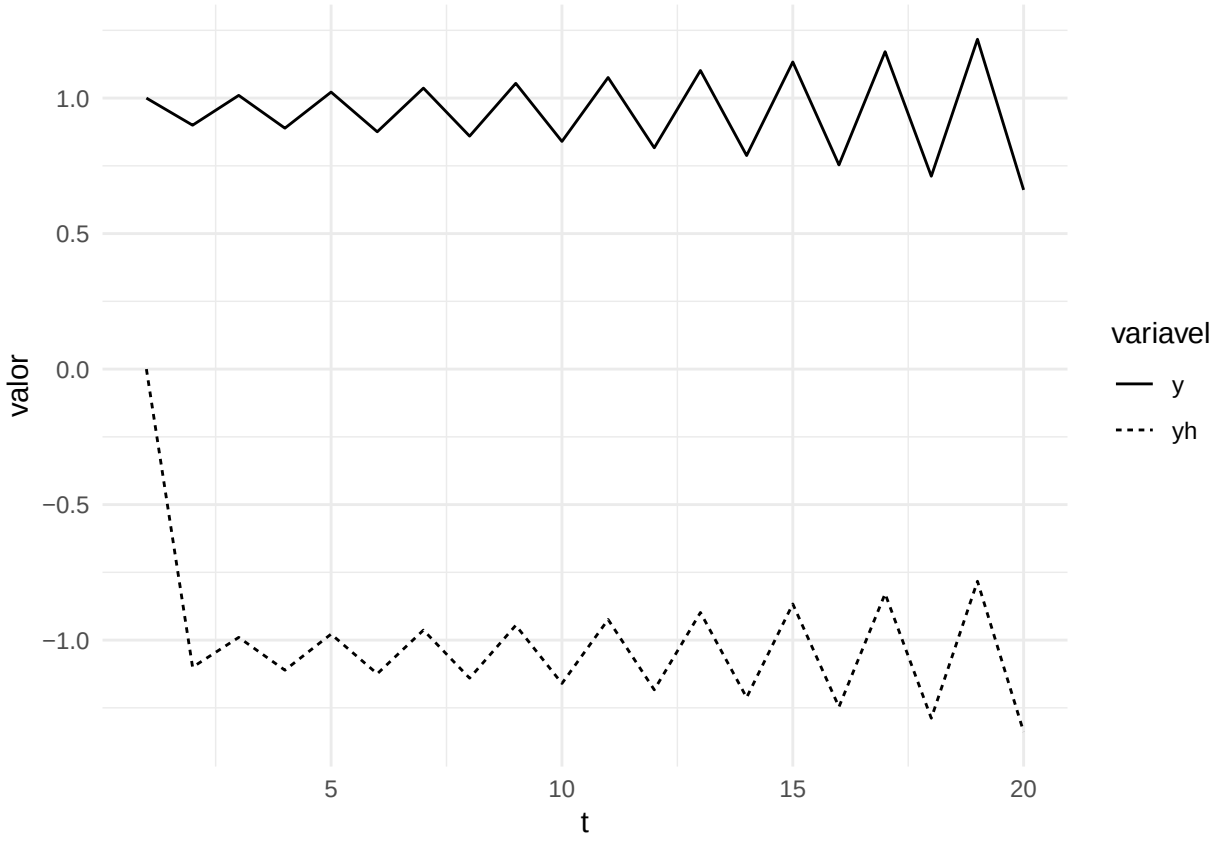
```
png(filename = "grafico_series.png")

grafico <- ggplot(series_gathered, aes(x = t, y = valor, color = variavel)) +
```

```
  geom_line(  size = 1 ) +

  facet_wrap( ~variavel, ncol = 2, scales = "free") +

  theme_minimal()

grafico

dev.off()
```

```
## pdf
##   2
```

Equações em diferença de ordem 1 - caso não homogêneo

```
t = 1:20

y = rep(0, length(t))
yh = rep(0, length(t))

y[1] = 1

a0 = -1.1

b = 2


for(time in 2:max(t) ){

  y[time] = a0*y[time-1] + b
  yh[time] = a0*y[time-1]


}


series2 <- data.frame(t, y, yh)

series2_gathered <- series2 %>% gather( key="variavel", value = "valor" , -t)

ggplot( data = series2_gathered, mapping = aes(x=t, y= valor, linetype=variavel)) +

  geom_line() +

  theme_minimal()
```



Sites interessantes

Plot time series data using GGPLOT

Data visualizarion with ggplot2