

## Fitting parametric model - example

$$R[t\_ , \beta 0\_ , \beta 1\_ , \beta 2\_ , \beta 3\_ ] := \beta 0 + \beta 1 \frac{1 - e^{-\alpha * t}}{\alpha * t} + \beta 2 \frac{1 - (1 + \alpha * t) e^{-\alpha * t}}{\alpha * t} + \beta 3 \frac{1 - (1 + b * t) e^{-b * t}}{b * t};$$

$$\alpha = 1.1; b = 1.5;$$

$$B[t\_ , \beta 0\_ , \beta 1\_ , \beta 2\_ , \beta 3\_ ] := e^{-t * R[t, \beta 0, \beta 1, \beta 2, \beta 3]};$$

$$Cp[t\_ , c\_ , \beta 0\_ , \beta 1\_ , \beta 2\_ , \beta 3\_ ] := 0.5 * \sum_{i=1}^{2*t} c * e^{-(i/2) * R[i/2, \beta 0, \beta 1, \beta 2, \beta 3]} + e^{-t * R[t, \beta 0, \beta 1, \beta 2, \beta 3]};$$

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In[14]:= {b0, b1, b2, b3} = {β0, β1, β2, β3} /. Minimize[
  (0.987228` - B[0.25, β0, β1, β2, β3])^2 + (0.974052` - B[0.5, β0, β1, β2, β3])^2 +
  (0.947111` - B[1, β0, β1, β2, β3])^2 + (0.920041` - B[1.5, β0, β1, β2, β3])^2 +
  (95.282498 / 100 - Cp[6, 0.05, β0, β1, β2, β3])^2 +
  (88.207090 / 100 - Cp[7.5, 0.04, β0, β1, β2, β3])^2 +
  (114.447593 / 100 - Cp[9.5, 0.08, β0, β1, β2, β3])^2 +
  (107.78971 / 100 - Cp[11.5, 0.07, β0, β1, β2, β3])^2 +
  (1 - Cp[2, 5.714552 / 100, β0, β1, β2, β3])^2 +
  (1 - Cp[3, 5.821686 / 100, β0, β1, β2, β3])^2 +
  (1 - Cp[5, 5.919199 / 100, β0, β1, β2, β3])^2 +
  (1 - Cp[7, 5.961478 / 100, β0, β1, β2, β3])^2 +
  (1 - Cp[7, 5.992611 / 100, β0, β1, β2, β3])^2 +
  (0.8932950547873345` - B[2, β0, β1, β2, β3])^2, {β0, β1, β2, β3}][[2]]
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Out[14]= {0.0608141, -0.0131687, -0.0149265, 0.0198285}
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Duration weighted

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In[18]:= Dur[t\_ , c\_ , β0\_ , β1\_ , β2\_ , β3\_ ] :=
  \sum_{i=1}^{2*t} \frac{0.5 * c * (i / 2) * e^{-(i/2) * R[i/2, \beta 0, \beta 1, \beta 2, \beta 3]}}{Cp[t, c, \beta 0, \beta 1, \beta 2, \beta 3]} + \frac{1 * t * e^{-(t) * R[t, \beta 0, \beta 1, \beta 2, \beta 3]}}{Cp[t, c, \beta 0, \beta 1, \beta 2, \beta 3]};
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In[19]:= {B0, B1, B2, B3} =
  {β0, β1, β2, β3} /. Minimize[(1 / 0.25) (0.987228` - B[0.25, β0, β1, β2, β3])^2 +
    (1 / 0.5) (0.974052` - B[0.5, β0, β1, β2, β3])^2 + (0.947111` - B[1, β0, β1, β2, β3])^2 +
    (1 / 1.5) (0.920041` - B[1.5, β0, β1, β2, β3])^2 +
    (1 / Dur[6, 0.05, β0, β1, β2, β3]) (95.282498 / 100 - Cp[6, 0.05, β0, β1, β2, β3])^2 +
    (1 / Dur[7.5, 0.04, β0, β1, β2, β3])
    (88.207090 / 100 - Cp[7.5, 0.04, β0, β1, β2, β3])^2 +
    (1 / Dur[9.5, 0.08, β0, β1, β2, β3])
    (114.447593 / 100 - Cp[9.5, 0.08, β0, β1, β2, β3])^2 +
    (1 / Dur[11.5, 0.07, β0, β1, β2, β3])
    (107.78971 / 100 - Cp[11.5, 0.07, β0, β1, β2, β3])^2 +
    (1 / Dur[2, 5.714552 / 100, β0, β1, β2, β3])
    (1 - Cp[2, 5.714552 / 100, β0, β1, β2, β3])^2 +
    (1 / Dur[3, 5.821686 / 100, β0, β1, β2, β3])
    (1 - Cp[3, 5.821686 / 100, β0, β1, β2, β3])^2 +
    (1 / Dur[5, 5.919199 / 100, β0, β1, β2, β3])
    (1 - Cp[5, 5.919199 / 100, β0, β1, β2, β3])^2 +
    (1 / Dur[7, 5.961478 / 100, β0, β1, β2, β3])
    (1 - Cp[7, 5.961478 / 100, β0, β1, β2, β3])^2 +
    (1 / Dur[7, 5.992611 / 100, β0, β1, β2, β3])
    (1 - Cp[7, 5.992611 / 100, β0, β1, β2, β3])^2 +
    (1 / 2) (0.8932950547873345` - B[2, β0, β1, β2, β3])^2, {β0, β1, β2, β3}][[2]]

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Out[19]= {0.0606107, -0.0113682, -0.00756419, 0.0096224}

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In[21]:= Plot[{R[t, b0, b1, b2, b3], R[t, B0, B1, B2, B3]}, {t, 0, 10}, PlotStyle -> {Red, Blue}]

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