

The background is a gradient of dark blue and purple, speckled with small white dots. On the left side, there are several concentric circles and a large circular scale with degree markings from 140 to 260. Arrows indicate a clockwise direction of movement. The text 'FIXED INCOME' is positioned on the right side of the image.

FIXED INCOME

NS MODEL FORMULA & PARAMETERS

NS Model:

$$r(T) = \beta_0 + \frac{\beta_1 \left(1 - e^{-\frac{T}{\tau}}\right)}{\frac{T}{\tau}} + \beta_2 \left(\frac{1 - e^{-\frac{T}{\tau}}}{\frac{T}{\tau}} - e^{-\frac{T}{\tau}}\right)$$

NSS Model:

$$r(T) = \beta_0 + \frac{\beta_1 \left(1 - e^{-\frac{T}{\tau}}\right)}{\frac{T}{\tau}} + \beta_2 \left(\frac{1 - e^{-\frac{T}{\tau}}}{\frac{T}{\tau}} - e^{-\frac{T}{\tau}}\right) + \beta_3 \left(\frac{1 - e^{-\frac{T}{\tau_2}}}{\frac{T}{\tau_2}} - e^{-\frac{T}{\tau_2}}\right)$$

FORMULA

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Term 1

Term 2

Term 3

$$r(t) = \text{beta0} + \text{beta1} * \text{part1} + \text{beta2} * (\text{part1} - \text{part2})$$

$$\text{part1} = (1 - \text{part2}) / \text{part3}$$

$$\text{part2} = \text{math.e}^{**}(-\text{part3})$$

$$\text{part3} = T / \text{tau}$$



TERM

- **Term1:**

β_0 defines the long term level of zero rates ($T \rightarrow \infty$, $r(t) = \beta_0$)

- **Term2:**

$\beta_1 \cdot \text{part1}$ introduces an exponential time decay that becomes slower the bigger τ is

- **Term3:**

$\beta_2 \cdot (\text{part1} - \text{part2})$ produces either a hump ($\beta_2 > 0$) or a trough ($\beta_2 < 0$)

- **Term1+Term2:**

$\beta_0 + \beta_1 \cdot \text{part1}$ equal almost short dated zero rates ($T \rightarrow 0$, $r(t) = \beta_0 + \beta_1 \cdot \text{part1}$)

$$r(t) = \beta_0 + \beta_1 \cdot \text{part1} + \beta_2 \cdot (\text{part1} - \text{part2})$$

$$\text{part1} = (1 - \text{part2}) / \text{part3}$$

$$\text{part2} = \text{math.e}^{-(\text{part3})}$$

$$\text{part3} = T / \tau$$



PARAMETERS

- **Beta0:**

Adjust Level (y value)

- **Beta1:**

Adjust Scope

$\beta_1 > 0$

$\beta_1 < 0$

- **Beta2:**

Adjust Curvature

$\beta_2 > 0$

$\beta_2 < 0$

- **Tau:**

Adjust hump/trough position

$$r(t) = \text{beta0} + \text{beta1} * \text{part1} + \text{beta2} * (\text{part1} - \text{part2})$$

$$\text{part1} = (1 - \text{part2}) / \text{part3}$$

$$\text{part2} = \text{math.e}^{*(-\text{part3})}$$

$$\text{part3} = T / \text{tau}$$

