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:

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

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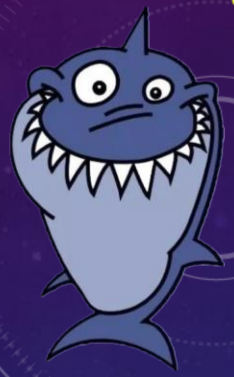

FORMULA

$$r(t) = \overbrace{\text{beta0}}^{\text{Term 1}} + \overbrace{\text{beta1*part1}}^{\text{Term 2}} + \overbrace{\text{beta2*(part1-part2)}}^{\text{Term 3}}$$

part1 = (1-part2)/part3

part2 = math.e**(-part3)

part3 = T/tau

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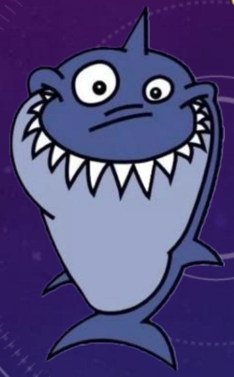

TERM

- **Term1:**

beta0 defines the long term level of zero rates (T->∞, r(t) = beta0)

- **Term2:**

beta1*part1 introduces an exponential time decay that becomes slower the bigger tau is

- **Term3:**

beta2*(part1-part2) produces either a hump (β2>0) or a trough (β2<0)

- **Term1+Term2:**

beta0+beta1*part1 equal almost short dated zero rates (T->0, r(t)=beta0+beta1*part1)

r(t) = beta0+beta1*part1+beta2*(part1-part2)

part1 = (1-part2)/part3

part2 = math.e**(-part3)

part3 = T/tau

PARAMETERS

- **Beta0:**

Adjust Level (y value)

- **Beta1:**

Adjust Scope $\beta1>0$ $\beta1<0$

- **Beta2:**

Adjust Curvature $\beta2>0$ $\beta2<0$

- **Tau:**

Adjust hump/trough position

```
r(t) = beta0+beta1*part1+beta2*(part1-part2)
part1 = (1-part2)/part3
part2 = math.e**(-part3)
part3 = T/tau
```

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