

Assumption 1: Tracking error is described by the contraction bound $\Delta w \approx \beta_s \Delta s$, where $\beta_s = c_1 M^{-\psi} + c_2$ and

$$\Delta s = \|s_{k+1} - s_k\|$$

Definition: $M = a \cdot Ts$, where a is computational power.

Assumption 2: $\Delta s \approx b \cdot Ts$

$$\text{Function: } f(Ts) = \beta_s \Delta s = [c_1(a \cdot Ts)^{-\psi} + c_2](b \cdot Ts) = (c_1 a^{-\psi} b) Ts^{-\psi+1} + c_2(b \cdot Ts)$$

Assumption 3: $\psi > 1$

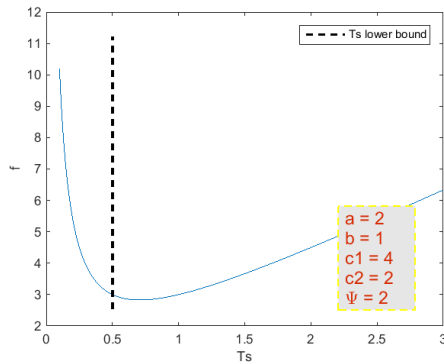
$Ts \in [0, +\infty]$, $f(Ts)$ firstly decreases then increases.

$$\text{Minima } f(Ts^*) : f' = (c_1 a^{-\psi} b)(-\psi + 1) Ts^{-\psi} + c_2 b = 0 \Leftrightarrow (c_1 a^{-\psi} b)(\psi - 1) Ts^{-\psi} = c_2 b$$

$$\Leftrightarrow Ts^* = \left[\frac{(c_1 a^{-\psi} b)(\psi - 1)}{c_2 b} \right]^{1/\psi} = \frac{1}{a} \left[\frac{c_1(\psi - 1)}{c_2} \right]^{1/\psi}$$

$$\text{Ts lower bound: } M \geq 1 \Rightarrow Ts^{\text{lb}} = \frac{1}{a}$$

$$\text{Assumption 4: } \left[\frac{c_1(\psi - 1)}{c_2} \right]^{1/\psi} > 1 \Rightarrow Ts^* > Ts^{\text{lb}}$$



Parameter differences in previous simulation corresponding to Assumption 2: Parameter differences between two consecutive OPF problems. ΔD is demand difference, ΔB is battery state difference.

