with
\[
\tilde{\beta}_{-p} = [\tilde{\beta}_1, \ldots, \tilde{\beta}_{p-1}, \tilde{\beta}_{p+1}, \ldots, \tilde{\beta}_p]'
\]
being the least squares estimate of $\beta_{-p}$ conditional on $\beta_p$.

The vector $[\beta_p, \tilde{\beta}_{-p}]'$ is defined as
\[
[\beta_p, \tilde{\beta}_{-p}]' = [\tilde{\beta}_1, \ldots, \tilde{\beta}_{p-1}, \beta_p, \tilde{\beta}_{p+1}, \ldots, \tilde{\beta}_p]'.
\]

For the nonlinear model $f(x; \theta)$, the profile $t$ function $\tau = \tau(\theta_p)$ is defined as
\[
\tau = \text{sign}(\theta_p - \hat{\theta}_p) \sqrt{\frac{\tilde{S}(\theta_p) - S(\theta)}{s}}.
\]

The nominal $(1 - \alpha)100\%$ likelihood–based confidence interval is then
\[
-t(N - P; \alpha/2) < \tau < t(N - P; \alpha/2).
\]

If the model is linear, then the plot of $\tau(\theta_p)$ versus $\theta_p$ should appear as a straight line. For a nonlinear model, curvature in the plot of $\tau$ vs $\theta$ is a measure of the overall non–linearity in the model.

The profile plot provides an exact likelihood based interval for individual parameters.

The S–PLUS implementation of this profile function is as given here, whereas the R implementation (by default) plots the absolute value of $\tau$ and so the ideal function when the model is linear is proportional to the absolute value function. Hence asymmetry in $\tau$ about the MLE (cusp) in the R implementation can also be used as a gauge of nonlinearity. To obtain the identity form in R, use `absVal=F` when plotting the profile. Thus for example, the command

\[
\text{plot(pc)}
\]

in the R code for the Coal Data Problem (Section 4.3.2), would become

\[
\text{plot(pc, absVal=F)}
\]

if the identity form was required for compatibility with S–PLUS or Bates and Watts, 1988.