The asymptotic behavior of the effective mass $m_{\text{eff}}(\Lambda)$ of the so-called Nelson model in quantum field theory is considered, where $\Lambda$ is an ultraviolet cutoff parameter of the model. Let $m$ be the bare mass of the model. It is shown that for sufficiently small coupling constant $|\alpha|$ of the model, $m_{\text{eff}}(\Lambda)/m$ can be expanded as $m_{\text{eff}}(\Lambda)/m = 1 + \sum_{n=1}^{\infty} a_n(\Lambda) \alpha^{2n}$. A physical folklore is that $a_n(\Lambda) = O((\log \Lambda)^{(n-1)}) (\Lambda \to \infty)$. It is rigorously shown that

$$0 < \lim_{\Lambda \to \infty} a_1(\Lambda) < C, \quad C_1 \leq \lim_{\Lambda \to \infty} a_2(\Lambda)/\log \Lambda \leq C_2$$

with some constants $C$, $C_1$ and $C_2$. (Received March 18, 2017)