Proof: For each positive integer p, we have

$$\begin{aligned} s_p &:= \sum_{k=0}^{p} \binom{n+k}{k}^{-1} = \sum_{k=0}^{p} (n+k+1)\int_0^1 t^k (1-t)^n dt \\ &= \int_0^1 \left\{ (n+1)(1-t)^n \sum_{k=0}^{p} t^k + (1-t)^n \sum_{k=0}^{p} kt^k \right\} dt \\ &= (n+1)\int_0^1 (1-t)^n dt - (n+1)\int_0^1 t^{p+1}(1-t)^{n-1} dt + \int_0^1 t(1-t)^{n-2} dt \\ &\qquad - (p+1)\int_0^1 t^{p+1}(1-t)^{n-2} dt + p\int_0^1 t^{p+2}(1-t)^{n-2} dt. \end{aligned}$$

Formula (1) yields

$$s_p = \frac{n}{n-1} - (n-2)!\frac{(np+p+1)(p+1)!}{(p+n+1)!} - (n+1)(n-1)!\frac{(p+1)!}{(p+n+1)!}.$$

Taking into account that $n \geq 2$, we conclude that $s_p \to \frac{n}{n-1}$ when $p \to \infty$.

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