Proposed problem 3557 sept.2010
Crux Mathematicorum with mathematical Mayhem

Let $\{a_k\}_{k=1}^{\infty} > 0$ *be a sequence of positive real numbers with* $\displaystyle\sum_{k=1}^{\infty} a_k = 1$ *and* $a_{k+1} \leq a_k/(1-a_k)$. *Let* $S_n^{(p)} \doteq \big(\displaystyle\sum_{k=1}^{n} a_k^p\big)^{1/p}$ *and for* $p \geq 1$ *prove that*

$$\lim_{n\to+\infty} \sum_{k=n+1}^{2n} \frac{k}{n}\Big(\prod_{j=1}^{n} \frac{j^{\frac{1}{p}} a_{k+j} a_j}{S_{k+j}^{(p)}}\Big)^{1/n} = 0$$