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On the global attractivity and the periodic character of some difference equations. (English)

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Asymptotic properties of solutions of the k-th order difference equation

$$x_{n+1} = \frac{A_0}{x_n} + \frac{A_1}{x_{n-1}} + \cdots + \frac{A_{k-1}}{x_{n-k+1}}, \quad n \in \mathbb{N} = \{0, 1, \dots\} \tag{*}$$

are investigated. It is shown that under some restrictions on the numbers $A_0, \dots, A_{k-1}$ every positive solution of (*) converges to a p-periodic solution, where the period p is determined in terms of the coefficients $A_0, \dots, A_{k-1}$. The main result of the paper reads as follows.

Theorem. Let $A_0, \dots, A_{k-1}$ be nonnegative real numbers and suppose that the set $J = \{j \geq 1 : \ A_{j-1} > 0\}$ is nonempty. Set $L = \{i + j : i, j \in J\}$, and let $p = 2(\langle L\rangle + 1) - \langle L\rangle/\langle J\rangle$, where $\langle\cdot\rangle$ denotes the greatest common divisor of the elements of the set indicated. Then every positive solution of (*) converges to a periodic solution of (*) with (not necessarily prime) period p. Moreover, there exist solutions of (*) which are periodic with prime period p.

Reviewer: Ondřej Došlý (Brno)

MSC:

39A12	Discrete version of topics in analysis
37C70	Attractors and repellers of smooth dynamical systems and their topological structure
39A11	Stability of difference equations (MSC2000)
39A10	Additive difference equations

Cited in **1** Review
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