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# STABILITY OF SOLUTIONS FOR A FAMILY OF NONLINEAR DELAY DIFFERENCE EQUATIONS*

Taixiang Sun[1,*], Hongjian Xi[1,2], Hui Wu[1] and Caihong Han[1]

[1]Department of Mathematics, Guangxi University,
Nanning, Guangxi 530004, P.R. China

[2]Department of Mathematics, Guangxi College of Finance and Economics,
Nanning, Guangxi, 530003, P.R. China

**Abstract.** In this paper, we study a class of nonlinear delay difference equations and obtain sufficient conditions under which the unique equilibrium $\overline{x} = 1$ of the equations are globally asymptotically stable, which extends and includes corresponding results obtained in the recent literature.

**Keywords.** Delay difference equation, global asymptotic stability, equilibrium, positive solution.

**AMS (MOS) subject classification:** 39A10; 39A11

# 1 Introduction

Difference equations appear naturally as discrete analogous of differential and delay differential equations which model various diverse phenomena in biology, ecology, physiology, physics, engineering and economics. For a detail study of the theorem of difference equations (see[1-6]).

In [7], Ladas put forward to investigate the global asymptotic stability of the following nonlinear delay difference equation

$$x_{n+1} = \frac{x_n + x_{n-1}x_{n-2}}{x_n x_{n-1} + x_{n-2}}, \quad n = 0, 1, \cdots, \tag{E1}$$

where the initial values $x_{-2}, x_{-1}, x_0 \in R_+ \equiv (0, +\infty)$.

In [8], Nesemann utilized the strong negative feedback property to study the following delay difference equation

$$x_{n+1} = \frac{x_{n-1} + x_n x_{n-2}}{x_n x_{n-1} + x_{n-2}}, \quad n = 0, 1, \cdots, \tag{E2}$$

where the initial values $x_{-2}, x_{-1}, x_0 \in R_+$.

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0*Corresponding author: E-mail: stx1963@163.com, stxhql@gxu.edu.cn