

ASYMPTOTIC BEHAVIOR OF THE POSITIVE SOLUTIONS OF A SYSTEM OF K DIFFERENCE EQUATIONS OF EXPONENTIAL FORM

N. Fotiades¹ and G. Papaschinopoulos²

¹School of Engineering
Democritus University of Thrace, 67100 Xanthi, Greece

²School of Engineering
Democritus University of Thrace, 67100 Xanthi, Greece

Corresponding author email:gpapas@env.duth.gr

Abstract. In this paper we study the asymptotic behavior of the positive solutions of the system of k difference equations of exponential form

$$x_{i,n+1} = a_i + b_i x_{i,n-1} e^{-x_{i+1,n}}, \quad i = 1, 2, \dots, k$$

where $a_i, b_i, i = 1, 2, \dots, k$ are positive constants and the initial values $x_{i,n}, i = 1, 2, \dots, k, n = -1, 0$ are real positive numbers and $x_{k+1,n} = x_{1,n}, n = 0, 1, \dots$

Keywords. System of difference equations, bounded, persists, positive equilibrium, global asymptotic stability, unbounded solutions.

AMS (MOS) subject classification: 39A10.

1 Introduction

Recently there has been an increasing interest in studying systems of difference equations (see for example [9]-[13], [19], [23], [27]-[30], [41], [42], [47]-[49]).

In [24] the authors studied the asymptotic behavior of the positive solutions, the existence of a unique positive equilibrium and the stability of the unique positive equilibrium of the difference equation

$$x_{n+1} = a + bx_{n-1}e^{-x_n} \tag{1}$$

where a, b are positive constants and the initial values x_{-1}, x_0 are positive numbers.

In addition the authors in [27] extended the results obtained in [24] by studying the following system of difference equations

$$x_{n+1} = a + bx_{n-1}e^{-y_n}, \quad y_{n+1} = c + dy_{n-1}e^{-x_n}$$

where the constants a, b, c, d are positive numbers and the initial values x_{-1}, x_0, y_{-1}, y_0 are also positive numbers.