

Preapp DSF 9.10.2024

$$5) \quad \alpha \bar{p} + (3-\alpha)\bar{p} - \bar{p} = 6$$

$$\bar{p} = \frac{6}{2} = 3$$

$$2\lambda^2 + (3-\alpha)\lambda - 1 \Rightarrow \lambda^2 + \frac{3-\alpha}{2}\lambda - \frac{1}{2}$$

$$\left| \frac{3-\alpha}{2} \right| < 1 - \frac{1}{2} < 2$$

$$\frac{1}{2} > 1-2 \quad \checkmark$$

$$3-\alpha < \alpha-1$$

$$2\alpha > 4$$

$$\alpha > 2$$

$$\alpha = 2: \quad 2\lambda^2 + \lambda - 1 = 0$$

$$\lambda = \frac{-1 \pm 3}{4} = \begin{matrix} -1 \\ \frac{1}{2} \end{matrix}$$

$$p_R = c_1 (-1)^h + c_2 \frac{1}{2^h} \quad \text{simply stable}$$
$$x_{h+2} + \alpha x_{h+1} - x_{h+1} x_h + b x_h = 0$$

$$1) \quad x_{h+2} - 2x_{h+1} - x_{h+1}x_h + 2x_h = 0$$

$$\bar{x} - \bar{x}^2 = 0 \quad \begin{cases} \bar{x} = 0 \\ \bar{x} = 1 \end{cases}$$

$$\begin{cases} x_{h+1} = y_h \\ y_{h+1} = 2y_h + x_h y_h - 2x_h \end{cases} \quad \begin{bmatrix} 0 & 1 \\ y-2 & 2+x \end{bmatrix}$$

$$(0, 0) \quad \begin{bmatrix} 0 & 1 \\ -2 & 2 \end{bmatrix} \quad \begin{matrix} \tau = 2 \\ \delta = 2 \end{matrix} \quad 2 < 1+2 < 2 \quad \text{NO} \\ \Rightarrow \text{UNST}$$

$$(1, 1) \quad \begin{bmatrix} 0 & 1 \\ -1 & 3 \end{bmatrix} \quad \begin{matrix} \tau = 3 \\ \delta = 1 \end{matrix}$$

$$3 < 1+1 < 2 \quad \text{NO} \Rightarrow \text{UNST.}$$

$$2) \quad x = \frac{1-q}{q} = 2 \quad p_3 = \frac{x^3 - x^5}{1 - x^5} = \frac{8 - 32}{-31} = \frac{24}{31} = 77,4\%$$

$$q = \frac{1}{2} \Rightarrow p_3 = 1 - \frac{3}{5} = \frac{2}{5} = 40\%$$

$$3) \quad \begin{cases} -x + y = 0 \\ -x^3 + 2y = 0 \end{cases} \quad \begin{matrix} y = x \\ -x^3 + 2x = 0 \end{matrix} \quad \begin{matrix} x=0 \quad y=0 \\ x^2 = 2 \quad x = \pm\sqrt{2} \quad \alpha > 0 \\ y = \pm\sqrt{2} \end{matrix}$$

$$\begin{bmatrix} -1 & 1 \\ -3x^2 & 2 \end{bmatrix} \quad (0,0) \quad \begin{bmatrix} -1 & 1 \\ 0 & \alpha \end{bmatrix} \quad \begin{matrix} \alpha < 0 \quad \text{STAB. NODE} \\ \alpha > 0 \quad \text{SADDLE} \end{matrix}$$

$$(\pm\sqrt{2}, \pm\sqrt{2}) \quad \begin{bmatrix} -1 & 1 \\ -3\alpha & \alpha \end{bmatrix} \quad \begin{matrix} \tau = \alpha - 1 \\ \delta = -\alpha + 3\alpha = 2\alpha \end{matrix}$$

$$\alpha < 0 \quad \text{SADDLE} \quad 0 < \alpha < 1 \quad \text{ST.} \quad \alpha > 1 \quad \text{UNST}$$

$$\alpha^2 - 4\alpha = (\alpha - 1)^2 - 8\alpha = \alpha^2 + 1 - 2\alpha - 8\alpha = \alpha^2 - 10\alpha + 1 \geq 0$$

$$\alpha = 5 \pm \sqrt{25 - 1} = 5 \pm \sqrt{24}$$

$$0 < \alpha \leq 5 - \sqrt{24} \quad \text{ST. NODE}$$

$$5 - \sqrt{24} < \alpha < 1 \quad \text{ST. FOCUS}$$

$$1 < \alpha < 5 + \sqrt{24} \quad \text{UNST. FOCUS}$$

$$\alpha \geq 5 + \sqrt{24} \quad \text{UNST. NODE}$$

$$4) \begin{cases} \dot{Y} = -2Y + 3G - 3 \\ \dot{G} = Z \\ \dot{Z} = -2Z - kY - \frac{1}{3}(-2Y + 3G - 3) \end{cases}$$

$$\begin{cases} \dot{Y} = -2Y + 3G - 3 \\ \dot{G} = Z \\ \dot{Z} = \left(\frac{2}{3} - k\right)Y - G - 2Z + 1 \end{cases}$$

$$\bar{Z} = 0 \quad \begin{cases} -2Y + 3G - 3 = 0 \\ \left(\frac{2}{3} - k\right)Y - G + 1 = 0 \end{cases} \quad G = \left(\frac{2}{3} - k\right)Y + 1$$

$$-2Y + (2 - 3k)Y + 3 - 3 = 0$$

$$3kY = 0 \quad Y = 0 \quad \begin{pmatrix} 0, 1, 0 \end{pmatrix}$$

$$G = 1$$

$$\begin{bmatrix} -2 - \lambda & 3 & 0 \\ 0 & 0 - \lambda & 1 \\ \frac{2}{3} - k & -1 & -2 - \lambda \end{bmatrix}$$

$$\lambda(2+\lambda)(-2-\lambda) + 3\left(\frac{2}{3}-k\right) - 2-\lambda = 0$$

$$-\lambda(\lambda^2 + 4\lambda + 4) + \cancel{2} - 3k - \cancel{2} - \lambda = 0$$

$$-\lambda^3 - 4\lambda^2 - 4\lambda - 3k - \lambda = 0$$

$$\lambda^3 + 4\lambda^2 + 5\lambda + 3k = 0$$

$$3k > 0$$

$$k > 0 \text{ ok}$$

$$\left[\begin{array}{cc|c} 4 & 3k & 0 \\ 1 & 5 & 0 \\ \hline 0 & 4 & 3k \end{array} \right]$$

$$20 - 3k > 0 \quad 3k < 20 \quad k < \frac{20}{3}$$

$$k < \frac{20}{3} \text{ A.S.}$$

$$k > \frac{20}{3} \text{ UNST.}$$

