$$u_k = u_{k+1} p + u_{k-1} q \qquad p + q = 1$$

$$u_k (p+q) = u_{k+1} p + u_{k-1} q \quad (\cancel{p+q}) \to 1$$

$$u_k p + u_k q = \underline{u_{k+1}} p + u_{k-1} q$$

$$(u_k - u_{k+1}) p = (u_{k-1} - u_k) q$$

$$u_{k+1} - u_k = \frac{q}{p} (u_k - u_{k-1})$$

Resolviendo las iteraciones para K $k=0$

$u_0 = 1$

$$\underline{u_2 - u_1} = \frac{q}{p} (u_1 - u_0) \quad \to k=1 \qquad u_0 \to 1$$

$$u_3 - u_2 = \frac{q}{p} (u_2 - u_1) \quad \to k=2$$

$$u_4 - u_3 = \frac{q}{p} (u_3 - u_2)$$

$$u_2 - u_1 = \frac{q}{p} (u_1 - 1)$$

$$u_3 - u_2 = \frac{q}{p} \left(\frac{q}{p} (u_1 - 1) \right)$$

$$u_3 - u_2 = \underline{\left(\frac{q}{p}\right)^2 (u_1 - 1)}$$

$$u_4 - u_3 = \left(\frac{q}{p}\right) \left(\left(\frac{q}{p}\right)^2 (u_1 - 1) \right)$$

$$u_4 - u_3 = \left(\frac{q}{p}\right)^3 (u_1 - 1$$

$$u_2 - u_1 = \frac{q}{p} (u_1 - 1)$$

$$u_3 - u_2 = \left(\frac{q}{p}\right)^2 (u_1 - 1)$$

$$u_4 - u_3 = \left(\frac{q}{p}\right)^3 (u_1 - 1)$$

$$\vdots$$

$$u_k - u_{k-1} = \left(\frac{q}{p}\right)^{k-1} (u_1 - 1)$$

$$S_k = 1 + (q/p) + (q/p)^2 + \dots + (q/p)^k$$

$$u_k - u_1 = (S_{k-1} - 1)(u_1 - 1)$$

$$u_k - \cancel{u_1} = S_{k-1} u_1 - S_{k-1} - \cancel{u_1} + 1$$

$$u_k = S_{k-1} (\underline{\underline{u_1 - 1}}) + 1$$

$$u_a = 0$$

$$u_a = S_{a-1} (u_1 - 1) + 1$$

$$u_1 - 1 = \frac{-1}{S_a - 1}$$

$$u_k = \frac{-S_{k-1}}{S_a - 1} + 1 = 1 - \frac{S_{k-1}}{S_a - 1}$$

$$S_k = 1 + \underbrace{\overset{r}{\left(q/p\right)} + \left(q/p\right)^2 + \dots + \left(q/p\right)^k} \quad \begin{cases} k+1 & p = q \\ \dfrac{1-(q/p)^{k+1}}{1-q/p} & p \neq q \end{cases}$$

$$S_k = 1 + \underline{1} + \underline{1} + \dots + \underline{1}$$
$$= k+1$$

$$S_k = 1 + \cancel{r} + \cancel{r^2} + \cancel{r^3} + \dots + \cancel{r^k}$$
$$rS_k = \cancel{r} + \cancel{r^2} + \cancel{r^3} + \cancel{r^4} + \dots + r^{k+1}$$

$$S_k - rS_k = 1 - r^{k+1}$$

$$r = \frac{q}{p} = 1 \quad q = p$$

$$S_k(1-r) = 1 - r^{k+1}$$

$$S_k = \frac{1-r^{k+1}}{1-r} \quad r \neq 1 \qquad S_k = \frac{1-(q/p)^{k+1}}{1-q/p}$$

$$q = p$$

$$q_k = \frac{1}{1} - \frac{k}{a} = \frac{a-k}{a}$$

$$q_k = 1 - \frac{S_k - 1}{S_a - 1}$$

$$q = p$$

$$q_k = \frac{1}{1} - \frac{1-(q/p)^k}{1-(q/p)^a} = \frac{\cancel{1} - (q/p)^a - \cancel{1} + (q/p)^k}{1-(q/p)^a} = \frac{(q/p)^k - (q/p)^a}{1-(q/p)^a}$$

$$q_k = \frac{-S_k - 1}{S_a - 1} + \underline{1} = \underline{1} - \frac{S_k - 1}{S_a - 1}$$