$$\begin{array}{cccccccc} c_0 & c_1 & c_2 & c_3 & c_4 & c_5 & c_6 & c_7 \\ \Delta^1 c_0 & \Delta^1 c_1 & \Delta^1 c_2 & \Delta^1 c_3 & \Delta^1 c_4 & \Delta^1 c_5 & \Delta^1 c_6 & \\ \Delta^2 c_0 & \Delta^2 c_1 & \Delta^2 c_2 & \Delta^2 c_3 & \Delta^2 c_4 & \Delta^2 c_5 & & \\ \Delta^3 c_0 & \Delta^3 c_1 & \Delta^3 c_2 & \Delta^3 c_3 & \Delta^3 c_4 & & & \end{array}$$

$$P^{(r)}(t) = \frac{n!}{(n-r)!} \sum_{i=0}^{n-r} \Delta^r c_i B_i^{n-r}(t)$$

$$t = T \cdot s \Rightarrow \frac{dP}{dt} = \frac{dP}{ds} \cdot \frac{ds}{dt} = \frac{dP}{ds} \cdot \frac{1}{T}$$

$$B_i^{n-r}(t) = \binom{n-r}{i} x^i (1-x)^{n-r-i}$$

and so

$$\begin{aligned}
\mathbf{p}(t) &= \sum_{i=0}^{n} \mathbf{c}_i \binom{n}{i} \sum_{j=0}^{n-i} \binom{n-i}{j} (-1)^j t^{i+j} \\
&= \sum_{i=0}^{n} \mathbf{c}_i \binom{n}{i} \sum_{j=i}^{n} \binom{n-i}{j-i} (-1)^{j-i} t^j, \\
&= \sum_{j=0}^{n} \sum_{i=0}^{j} \mathbf{c}_i \binom{n}{i} \binom{n-i}{j-i} (-1)^{j-i} t^j,
\end{aligned}$$

and it follows that

$$\mathbf{a}_j = \sum_{i=0}^{j} \binom{n}{i} \binom{n-i}{j-i} (-1)^{j-i} \mathbf{c}_i.$$

This can alternatively we written as

$t(1-t)^4$

t^0

$$\mathbf{a}_j = \sum_{i=0}^{j} \binom{n}{j} \binom{j}{i} (-1)^{j-i} \mathbf{c}_i = \binom{n}{j} \Delta^j \mathbf{c}_0.$$

$$\begin{array}{cccccccccc} c_0 & c_1 & c_2 & c_3 & c_4 & c_5 & c_6 & c_7 & c_8 & c_9 \\ \Delta^1 c_0 & \Delta^1 c_1 & \Delta^1 c_2 & \Delta^1 c_3 & \Delta^1 c_4 & \Delta^1 c_5 & \Delta^1 c_6 & \Delta^1 c_7 & \Delta^1 c_8 & \\ \Delta^2 c_0 & \Delta^2 c_1 & \Delta^2 c_2 & \Delta^2 c_3 & \Delta^2 c_4 & \Delta^2 c_5 & \Delta^2 c_6 & \Delta^2 c_7 & & \\ \Delta^3 c_0 & \Delta^3 c_1 & \Delta^3 c_2 & \Delta^3 c_3 & \Delta^3 c_4 & \Delta^3 c_5 & \Delta^3 c_6 & & & \\ \Delta^4 c_0 & \Delta^4 c_1 & \Delta^4 c_2 & \Delta^4 c_3 & \Delta^4 c_4 & \Delta^4 c_7 & & & & \end{array}$$

$(1-t)t^8$

$t^8 \cdot t^9$

8×1

9×8

$$\begin{cases} \Delta^r c_0 = \frac{(n-r)!}{n!} p^{(r)}(0) \\ \Delta^r c_{n-r} = \frac{(n-r)!}{n!} p^{(r)}(1) \end{cases}$$

t^9

$$p^{(r)}(t) = \frac{n!}{(n-r)!} \sum_{i=0}^{n-r} \Delta^r c_i B_i^{n-r}(t)$$

$(1-t)t^8$

$p(s)$, $s \in [0,1]$

$t = T \cdot s$.

$$\frac{dp}{dt} = \frac{dp}{ds} \cdot \frac{ds}{dt} = \frac{dp}{ds} \cdot \frac{1}{T}$$