Some Types of Growth

We summarize characteristics of four types of growth in the following table.

Growth Type	Sample Difference Equation	Sample Functional Equation
Arithmetic	$F_n = F_{n-1} + 2$, and $F_0 = 5$	$F_n = 2n + 5$
Quadratic	$G_n = G_{n-1} + 2n + 7$, and $G_0 = 5$	$G_0 = n^2 + 8n + 5$
Exponential	$H_t = H_{t-1} + 0.07H_{t-1}$, and $H_0 = 1000$	$H_t = 1000(1.07)^t$
Logistic	$P_t = P_{t-1} + 0.002P_{t-1}(2000 - P_{t-1})$, and $P_0 = 300$	

In general,

Growth Type	Sample Difference Equation	Sample Functional Equation
Arithmetic	$F_n = F_{n-1} + d$, and $F_0 = c$	$F_n = dn + c$
Quadratic	$G_n = G_{n-1} + dn + c$, and $G(0) = e$	$G_n = (d/2)n^2 + (c+d/2)n + e$
Exponential	$H_t = H_{t-1} + kH_{t-1}$, and $H_0 = A_0$	$H_t = A_0(1+k)^t$
Logistic	$P_t = P_{t-1} + kP_{t-1}(L - P_{t-1})$, and $P_0 = s$	

For arithmetic growth, the difference between successive terms is constant.

For quadratic growth, the difference between successive terms grows arithmetically and the difference between successive differences (second difference) is (are) constant.

For exponential growth, the difference between successive terms is proportional to the first of the two terms. The percent change is constant.

For logistic growth the difference between successive terms is jointly proportional to the first of the two terms and the difference between the limiting value and the first of the two terms.

In cases where the domain is not {0, 1, 2, …, N} we must make adjustments to our growth factors.