FORMULA LINKING GOVERNMENT DEBT, NOMINAL GDP & INTEREST EXPENSE

$D_T = D_{T-1} + Def_T$ ***(Where D_t is the debt in Year T and Def_T is the fiscal deficit in Year T)***

$Def_T = pd_T + i * D_{t-1}$ ***(Where pd_T is primary deficit in Year T and i is effective interest rate on government interest)***

Nominal GDP is represented as Y_T growing at rate g_T; $Y_T = Y_{T-1} * (1 + g_T)$

Now to simplify the concept let's assume Primary Deficit is 0; then:

$D_T = D_{T-1} + i * D_{t-1}$

The Debt-to-Nominal GDP ratio(d_T) may be represented as:

$D_T / Y_T = D_{T-1} (1 + i) / Y_{T-1} * (1 + g_T)$

If the equation is expanded to multiple period then:

$d_n = d_0 * \{(1+i)/(1+g)\}^n$

If we assume pd_T is not zero, then the equation becomes:

$d_T - d_{T-1} = pd_T - (g_T - i_T)/(1+g_T) * d_T$