Answers to Exam No. 2 on Topics from Chapters 2 through 6

1. A simple way is to let $a = a_1 + a_2 N_t$ and $b = b_1 + b_2 N_t + b_3 Y_t$. Substituting this in the model, we get the unrestricted model (U) as

$$C_t = a_1 + a_2 N_t + Y_t\,(b_1 + b_2 N_t + b_3 Y_t) + u_t$$

$$= a_1 + a_2 N_t + b_1 Y_t + b_2 (Y_t N_t) + b_3 Y_t^2 + u_t$$

2. Differentiating the model partially with respect to N, we get $\dfrac{\partial C_t}{\partial N_t} = a_2 + b_2 Y_t$.

3. H_0: $a_2 = b_2 = 0$. H_1: At least one is not zero.

4. First regress C against a constant and Y and save the residuals as $u_t = C_t - \hat{a} - \hat{b} Y_t$. Next estimate the auxiliary regression by regressing u_t against a constant, N_t, Y_t, $Y_t N_t$. and Y_t^2. Then compute unadjusted R^2 in the auxiliary regression. Test statistic is LM = 40 R^2.

5. Under H_0, LM has the c^2 distribution with 2 d.f. From c_2^2, compute the area to the right of LM. If this is less than 0.10, we reject H_0.