The F-Test Approach: Restricted Least Squares

If there are constant returns to scale, economic theory would suggest that

$$\beta_2 + \beta_3 = 1$$

which is an example of a linear equality restriction

$$\beta_2 = 1 - \beta_3$$

$$\beta_3 = 1 - \beta_2$$

Therefore, using either of these equalities, we can eliminate one of the β coefficients in

$$lnY_i = \beta_0 + \beta_2 lnX_{2i} + \beta_3 lnX_{3i} + u_i$$

$$lnY_i = \beta_0 + (1 - \beta_3) lnX_{2i} + \beta_3 lnX_{3i} + u_i$$

$$lnY_i = \beta_0 + lnX_{2i} + \beta_3 (lnX_{3i} - lnX_{2i}) + u_i$$

$$(lnY_i - lnX_{2i}) = \beta_0 + \beta_3 (lnX_{3i} - lnX_{2i}) + u_i$$

$$(lnY_i / lnX_{2i}) = \beta_0 + \beta_3 (lnX_{3i} / lnX_{2i}) + u_i$$

$$(lnY_i/lnX_{2i}) = \beta_0 + \beta_3 (lnX_{3i}/lnX_{2i}) + u_i$$

Where (lnY_i/lnX_{2i}) = output/labor ratio and (lnX_{3i}/lnX_{2i}) = capital labor ratio, quantities of great economic importance