Homework 3 - Total Factor Productivity Growth in the US

In this homework we will redo what Solow (1957) did long ago. The key difference is that while Solow considered US data from 1909- 1949, we will focus on US data over the period 1948-2005. The data for this homework are in the file hwk3-data.xls. It contains aggregate measures of output, capital and labor for the US economy.

Output (Y)- real GDP.
Capital (K)- real net stock of private fixed assets.
Hours (L)- total hours of all persons in the non-farm business sector.

1. Using one of the two equations below, calculate the growth rate of technology ($\Delta A/A$) between each pair of years over the sample period using one of the two growth accounting equations below. Graph the series for the growth rate of technology ($\Delta A/A$), the growth rate of output $\Delta Y/Y$ and the growth rate of labor ($\Delta L/L$) on the same graph.

$$\Delta A/A = \Delta y/y - \omega_K \Delta k/k$$

$$\Delta A/A = \Delta Y/Y - \omega_K \Delta K/K - (1-\omega_K)\Delta L/L$$

Hint:

(i) Use $\omega_K = .36$ in the equation above. This amounts to assuming that capital's share is 36 percent of output. Recall homework 1!

(ii) If you use the first equation then $y = Y/L$ and $k = K/L$.

(iii) To calculate the growth rate $\Delta X/X$ in a variable X_t between year t and year $t+1$, use the formula $\frac{X_{t+1}-X_t}{X_t}$.

2. Set $A_{1948} = 1.0$. Calculate the A_t series using $A_{t+1} = A_t(1.0 + \Delta A/A)$, where $\Delta A/A$ is the growth rate of the technology calculated between year t and $t+1$. Graph the A_t series.

3. Graph the scatter plot of $(Y_t/L_t A_t, K_t/L_t)$. Make sure that the capital-labor ratio K/L is on the horizontal axis of the scatter plot. Note that this data set has as many points as the number of years in the data set.

4. Summarize the main findings from questions 1-3.