Average growth rate

Regression Equations:

We will solve estimating regression equations.
Let the variable *y* signify real GDP per capita. Assume that *y(t)* is a function of time:

$$y(t) = y_0 e^{gt}, \qquad (1)$$

where y_0 is *y* at time 0. The constant *g* is the (proportional) growth rate. To see this, differentiate both sides of the equation with respect to time, and denote the time derivative by a dot:

$$\dot{y} = y_0 g e^{gt} = gy.$$

The growth rate thus is:

$$\frac{\dot{y}}{y} = g.$$

Now take the natural logs of both sides of equation (1):

$$\ln y(t) = ln y_0 + gt.$$

We transform this into a regression equation, where we try to 'explain' the growth of *y* by time, *t*. Adding an error term we have:

$$\ln y(t) = \beta_0 + \beta_1 t + \epsilon_t, \qquad (2)$$

where, $\beta_0 = ln y_0$ and β_1 is the growth rate g.

Question:

Estimate equation (2) on the data for some country. Briefly explain the estimated growth rate.

Solution:

Using Country Snapshot, I have chosen data of United States. The data is from year 1950 to 2014 and it consists of 65 observations. I have found the data on $y = {}^{Y}/_{pop}$ that is the real GDP per capita and after taking natural log I have use the values for Input Y Range. For the Input X Range, I have use *t* which is the time from year 1 to year 65. After doing the regression analysis I have find the values of β_0 that is the constant or the intercept term and $\hat{B}_1$ that is the slope coefficient. The estimated growth rate β_1 is equal to 0.020998 where as the β_0 is equal to 9.605855.

$$\ln y(t) = 9.605855 + 0.020998t$$

The summary output is attached below.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.993123
R Square	0.986292
Adjusted R S	0.986075
Standard Err	0.047176
Observation	65

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	10.08854	10.08854	4533.018883	2.07803E-60
Residual	63	0.140211	0.002226		
Total	64	10.22875			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	9.605855	0.011839	811.3564	2.5012E-128	9.582196439	9.629514	9.582196439	9.62951416
t	0.020998	0.000312	67.3277	2.07803E-60	0.020375147	0.021622	0.020375147	0.02162165