Quiz 7 BUM2413. Applied Statistics, Sem II 2013/2014

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Question (10 points)

A tobacco company statistician wishes to know whether heavy smoking is related to longevity. The number of cigarettes smoked perday is recorded from a sample of deceased smokers. A study is conducted to examine whether the number of years that the smokers lived and the number of cigarettes they smoked per day are related.

Years of live	63	68	72	62	65	46	51
No of cigarettes	25	35	10	40	85	75	60

Given that:
$\sum x^2 = 20000,\ \sum x = 330,\ \sum y = 427,\ \sum y^2 = 26563,\ \sum xy = 19190$
$\bar{x} = 47.1429,\ \bar{y} = 61,\ S_{xx} = 4442.8571,\ S_{yy} = 516,\ S_{xy} = -940,\ MS_{Res} = 63.4192$

1. Identify the independent and dependent variables
   Independent (x) = no of cigarettes
   Dependent (y) = years of live
2. Estimate the simple linear regression model
   $\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x$
   $\hat{\beta}_1 = \frac{-940}{4442.8571} = -0.2116$
   $\hat{y} = 70.9849 - 0.2118x$
   $\hat{\beta}_0 = 61 - (-0.2118)(47.1429)$
   $= 70.9849$
3. Test the hypothesis for the intercept of the simple regression model at α =10%.
   Step 1 : Ho : $\beta_0 = 0$
   H1 : $\beta_0 \neq 0$
   Step 2 : $Se(\hat{\beta}_0) = \sqrt{63.4192\left(\frac{1}{7} + \frac{47.1429^2}{4442.8571}\right)}$
   $t\ test = \frac{70.9849 - 0}{6.3862}$
   $= 11.1154$
   Step 3 : critical value $= t_{\alpha/2, n-2} = 2.0150$
   Step 4 : $-t_{0.05,5} > t\ test > t_{0.05,5}$
   $-2.0150 < 11.1154 > 2.0150$
   decision : reject Ho
   Step 5 : the intercept of regression line is not zero $\beta_0 \neq 0$ at $x = 0$