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**Homework 2 1.**

*The variable rdintens is expenditures on research and development (R&D) as a percentage of sales. Sales are measured in millions of dollars. The variable profmarg is profits as a percentage of sales. Using the data in RDCHEM for 32 firms in the chemical industry, the following equation is estimated:*

**rdintens d = 0.472 + 0.321 log(sales) + 0.50profmarg,**

**(1.369) (0.216) (0.046)**

**n = 32, R2 = 0.099**

*(a)Interpret the coefficient on log(sales). In particular, if sales increases by 10%, what is the estimated percentage point change in rdintens?*

If log sales increase by 10%, it would be computed by multiplying the slope of log sales by 10%

(.321x 10/100)=.0321 numerically or 3.21%. This denotes the expected percent change of rdintens with respect to sales.

*(b) Test the hypothesis that R&D intensity does not change with sales against the alternative that it does change with sales. Do the test at the 5% and 10% levels.*

This is calculated by running a t-test on sales because we are trying to determine whether sales is significant on R&D.

Ho: b1 = 0

Ha: b1 > 0

BJhat(0.321)-BJ(0)/BJError(.216)=1.486

Df: n-k-1=32-2-1=29

This is calculated by taking the critical value against the t-test at different significance levels

T.INV(.975,29)= 2.045at 5%, The critical value is larger than the calculated value. we fail to reject the null hypothesis

T.INV(.95,29)=1.699 at 10%, The critical value is smaller than the calculated value, we fail to reject the null hypothesis

*(c) Interpret the coefficient on profmarg. In particular, if profmarg increases by 10 units, what is the estimated percentage point change in rdintens?*

Profmarg was described as profits as a percentage of sales. A unit change in profmarg will lead to .5 change in R&D. a 10% increase in profmarg would result in .5(.1)=.05 or 5% increase in R&D

*(d) Does profmarg have a statistically significant effect on rdintens at 5% significance level?*

We conduct the same test we preformed on sales. In this case we use profmarg slope.

Ho: b2 = 0

Ha=b2 > 0

.5-0/.046=10.87 critical value

Df:=29

T.INV( .975,29)=2.05 at 5% significance, the critical value is larger than the calculated value. We reject the null hypothesis that profit margin has an effect on R&D

***Computer Exercise 2.***

*The following model can be used to study whether campaign expenditures affect election outcomes:* **voteA = β0 + β1 log(expendA) + β2 log(expendB) + β3prtystrA + u,**

*where voteA is the percentage of the vote received by Candidate A, expendA and expendB are campaign expenditures by Candidates A and B, and prtystrA is a measure of party strength for Candidate A (the percentage of the most recent presidential vote that went to As party).*

1. *What is the interpretation of β1? In particular, if expendA increase by 1%, how will voteA change?*

Log(expendA) it would be explained as the expected percent change of VoteA with respect to an increase in expend A.

The multilinear regression model is shown below

voteA=45.08788 + 6.08136(expendA) -6.61563(expendB)+ .15201(prtystr)

(3.92680) (.38211) (.37889) (.06203)

If we were to increase expendA by 1% this would result in

For every 1% increase in expendA, VoteA will increase by 6.08136(.01)=.0608 or 6.08%

1. *In terms of the parameters, state the null hypothesis that a 1% increase in As expenditures is offset by a 1% increase in Bs expenditures.*

Ho: expendA-expendB=0

Ha:expendA-expendB=/0

1. *Estimate the given model using the data in VOTE1 and report the results in usual form. Do As expenditures affect the outcome? What about Bs expenditures? Can you use these results to test the hypothesis in part (b)?*

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Looking at our summary of our linear regression model. Both A and B expenditure affect the outcome, but we cannot estimate the results that expenditures affect the outcome without the samples covariance.

1. *Test the hypothesis in part (b) at 5% significance level using linearHypothesis function. What do you conclude?*

Text

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As you can see the P value is very small being 2.2e-16. This concludes that we can reject the null hypothesis that expend A cancels out expend B at the 10%,5% and 1% level.

*3. Use the data in WAGE2 for this exercise.*

*(a) Consider the standard wage equation log(wage) = β0 + β1educ + β2exper + β3tenure + u State the null hypothesis that another year of general workforce experience has the same effect on log(wage) as another year of tenure with the current employer.*

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B2-b3=0 or b2=b3

*(b) Test the null hypothesis in part (a) against a two-sided alternative, at the 5% significance level, by using linearHypothesis function. What do you conclude?*

*Text

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In this case we fail to reject the null hypothesis because the P value is larger than .05. Since their beta values are so close to each other that increasing both experience and tenure by 1 unit has a similar effect on the model.

*(c) Test the null hypothesis that β1 = β2 = β3 = 0 at 5% significance level.*

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Since the p-value for the linearhypothesis function of each are so low(.00078)(4.427e-06)(2.2e-16) the null hypothesis is rejected. Concluding that the variables influence the model.

*4. Use the data in sleep75 for this exercise.*

*(a) Consider the following model, sleep = β0 + β1totwrk + β2educ + β3age + u Is either education or age individually significant at 10 percent level in a two-tailed test?*

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Ho: Age=0 & Education=0

We fail to reject the null hypothesis that age does not have an effect on the model.

We reject the null hypothesis that education does not have an effect on the model.

*(b) Are education and age jointly significant at 10 percent level?*

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We can reject our null hypothesis that Age=0 and Education=0 since our p-value is .01894 and our alpha is .1.