Stat 2216 Spring 2005

Statistical Methods R. Claycombe

# Second Exam

Write all answers in your blue book and show all work there. Return your exam and printout(s) in your blue book.

30 pts.

1) Consider the data below. Do this work by hand and show your work.

| AC | Q |
|---|---|
| 10 | 5 |
| 8 | 6 |
| 8 | 7 |
| 10 | 8 |

a) Use least squares to find the coefficients in AC = a +bQ.

b) Find $r^2$ and interpret your result.

c) Find the standard error of the estimate.

d) Find $s_{b.}$

e) Construct a 95% confidence interval for B.

20 pts.

2) a) **Use computer here.** Use the data in question 1 to fit a model where

$AC = a + b_1Q + b_2Q^2$.

b) Do this part by hand. Sketch a scatter diagram of the data and the functions found in 1a and 2a. Compare the fits.

c) Explain the sense in which the model in question 1 is misspecified and how the slope in that model is thereby biased.

30 pts.

3) Consider the regression result below to answer the following questions.

# Regression

| Model Summary (b) | | | | |
|---|---|---|---|---|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
| 1 | .952(a) | .906 | .882 | 451.59889 |
| a Predictors: (Constant), Accounts, AdvExp, Share, Poten, Time | | | | |
| b Dependent Variable: Sales | | | | |

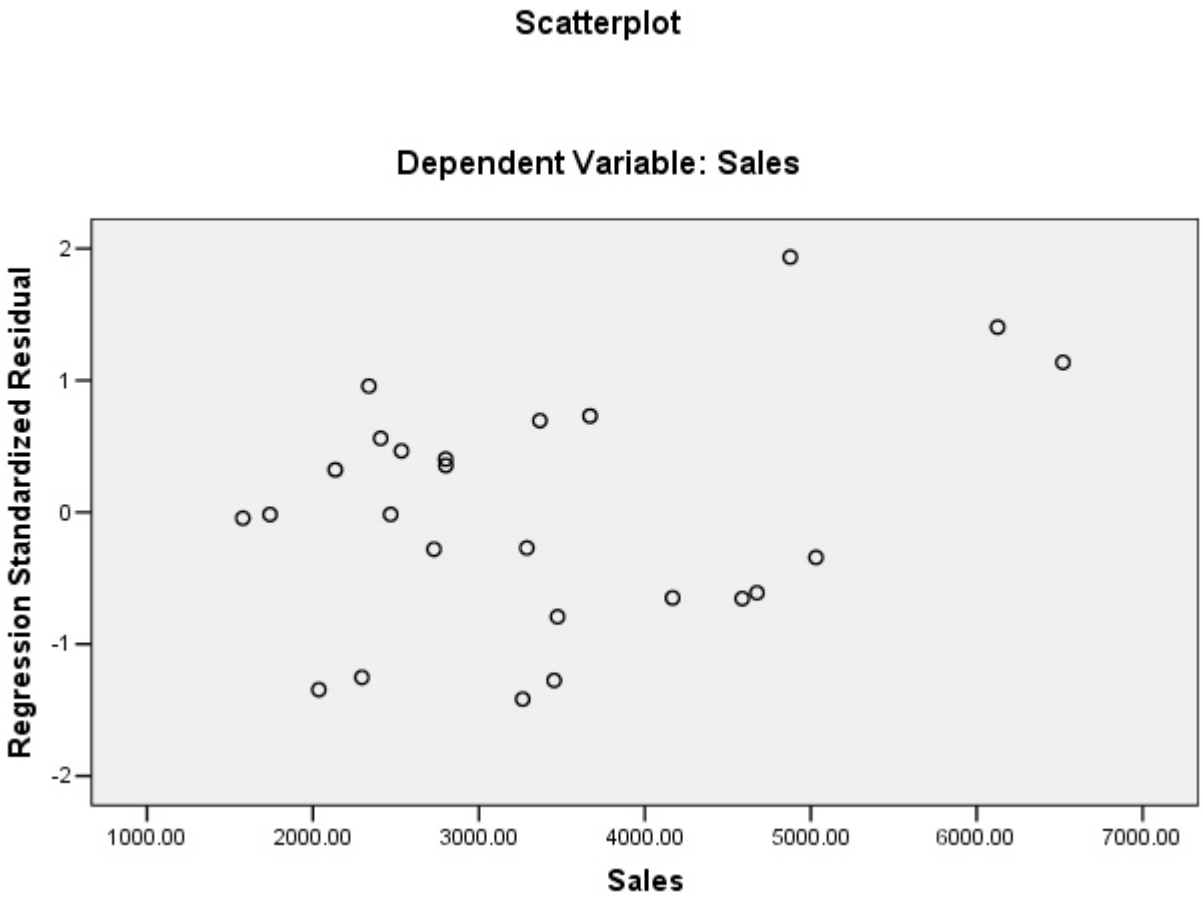
| ANOVA(b) | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | 37504659.347 | 5 | 7500931.869 | 36.780 | .000(a) |
| | Residual | 3874889.580 | 19 | 203941.557 | | |
| | Total | 41379548.927 | 24 | | | |
| a Predictors: (Constant), Accounts, AdvExp, Share, Poten, Time | | | | | | |
| b Dependent Variable: Sales | | | | | | |

| Coefficients(a) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | -1349.937 | 429.787 | | -3.141 | .005 | | |
| | Time | 1.952 | 1.783 | .129 | 1.095 | .287 | .355 | 2.817 |
| | Poten | .039 | .008 | .465 | 4.879 | .000 | .544 | 1.840 |
| | AdvExp | .165 | .038 | .337 | 4.343 | .000 | .817 | 1.223 |
| | Share | 210.855 | 52.990 | .395 | 3.979 | .001 | .500 | 1.999 |
| | Accounts | 5.970 | 4.112 | .207 | 1.452 | .163 | .242 | 4.134 |
| a Dependent Variable: Sales | | | | | | | | |

| Residuals Statistics(a) | | | | | |
|---|---|---|---|---|---|
| | Minimum | Maximum | Mean | Std. Deviation | N |
| Predicted Value | 1597.9921 | 6005.8198 | 3374.5676 | 1250.07765 | 25 |
| Std. Predicted Value | -1.421 | 2.105 | .000 | 1.000 | 25 |
| Standard Error of Predicted Value | 134.704 | 351.908 | 212.654 | 62.284 | 25 |
| Adjusted Predicted Value | 1601.5144 | 5710.8403 | 3374.9104 | 1264.79813 | 25 |

| | | | | | |
|---|---|---|---|---|---|
| Residual | -639.90729 | 873.92841 | .00000 | 401.81306 | 25 |
| Std. Residual | -1.417 | 1.935 | .000 | .890 | 25 |
| Stud. Residual | -1.565 | 2.030 | .000 | .999 | 25 |
| Deleted Residual | -780.93073 | 961.62219 | -.34278 | 513.96032 | 25 |
| Stud. Deleted Residual | -1.633 | 2.233 | .005 | 1.032 | 25 |
| Mahal. Distance | 1.175 | 13.613 | 4.800 | 3.443 | 25 |
| Cook's Distance | .000 | .195 | .048 | .051 | 25 |
| Centered Leverage Value | .049 | .567 | .200 | .143 | 25 |
| a Dependent Variable: Sales | | | | | |

# Charts




a) Write out the equation for the regression and use it to predict sales when all the independent variables are set at 100 except for Share. Let it be 1.

b) Interpret the F and t statistics.

c) Does there appear to an influential observation? Why?

d) Does there appear to be a collinearity problem? Why?

e) Are there any outliers? Why?

f) Does the scatter plot suggest that there are any econometric problems? Why?

10 pts

4) Computer Problem

a) Use SPSS to open MtnBikes in the Chapter 14 folder.

b) Use SPSS to estimate a model where Price = $AB^X$ where X is singletrack capability.

c) Use the model to predict Price when X is 2.

d) Compare the fit to that in a linear model and say which is better. Explain.

10 pts.

5) Sketch a well-labeled diagram that

a) illustrates the problem called heteroscedasticity.

b) illustrates the problem called autocorrelation.

c) illustrates the problem called colinearity.

I have neither given nor received unfair aid on this test nor am I aware of anyone else who has.

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