MATH202 05S Name:_____
Quiz 5 Solutions
Monday Pink Section:_____

10 points Attach your output/graphs to the back of this quiz. Use $\alpha = .05$.

Best's Review (June 1999) compared the mortgage loan portfolios for a sample of 25 life/health insurance companies. Suppose you want to model the percentage of problem mortgages of a company (y) as a function of total mortgage loans (x_1) and percentage of commercial mortgages (x_3).

Questions 1 – 4: Consider the analysis using y as the response variable.

1. **1 point** Write down the model you used for these data in terms of the β parameters, NOT the $\hat{\beta}$'s.

   $y = \beta_0 + \beta_1 x_1 + \beta_2 x_3 + \varepsilon$ or $E(y) = \beta_0 + \beta_1 x_1 + \beta_2 x_3$

2. **2 points** Interpret the estimated coefficient of x_3 in terms of this problem.

   $\hat{\beta}_2 = -.1786$ **We estimate that an increase of 1% in the percentage of commercial mortgages is associated with a decrease of .1786% in the percentage of problem mortgages, holding total mortgage loans constant.**

3. **4 points** Conduct the global F-test for the overall usefulness of this model. Show Ho and Ha, report the value of the F-statistic and p-value. Is there enough evidence that at least one predictor is useful for predicting the percentage of problem mortgages? Circle one: (YES, ***NO***).

   Ho: $\beta_1 = \beta_2 = 0$ **Ha: not Ho; at least 1** $\beta \neq 0$

   F = 2.08 p-value = .149 Do not reject Ho.

4. **2 points** Is there enough evidence that x_3 is a useful predictor of percentage of problem mortgages? Support your answer. Perform this test even if you circled NO in #3.

   Ho: $\beta_2 = 0$ **Ha:** $\beta_2 \neq 0$

   t = –1.36 p-value = .187 Do not reject Ho.

   No, there is not enough evidence that percentage of commercial mortgages is a useful predictor.

5. **1 point** Consider your regression analyses using ln(y) as the response. Did the transformation help to correct problems in the residual plots? If so, how?

   Yes. There is some evidence of non-normality in the residuals when using the untransformed data. Using ln(y) takes care of this non-normality.

Regression Analysis: ProbMort versus MortLoan, CommMort

The regression equation is
ProbMort = 20.1 + 0.000000 MortLoan - 0.179 CommMort

Predictor	Coef	SE Coef	T	P
Constant	20.14	12.38	1.63	0.118
MortLoan	0.00000043	0.00000030	1.42	0.170
CommMort	-0.1786	0.1312	-1.36	0.187

S = 7.49846 R-Sq = 15.9% R-Sq(adj) = 8.3%

Analysis of Variance

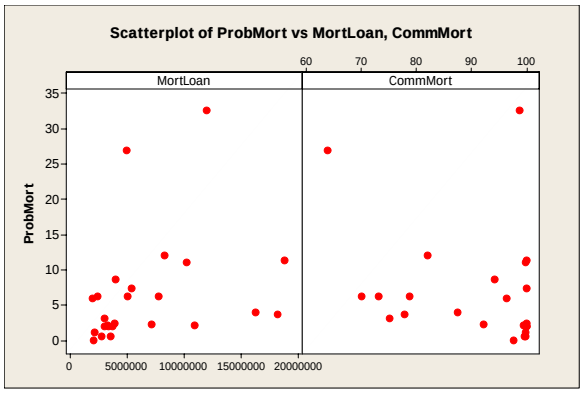
Source	DF	SS	MS	F	P
Regression	2	234.17	117.09	2.08	0.149
Residual Error	22	1236.99	56.23		
Total	24	1471.17			

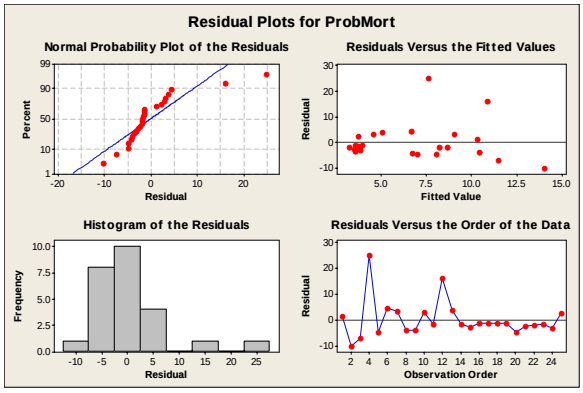
Predicted Values for New Observations

New Obs	Fit	SE Fit	95% CI	95% PI
1	5.31	1.63	(1.94, 8.69)	(-10.60, 21.23)

Values of Predictors for New Observations

New Obs	MortLoan	CommMort
1	5000000	95.0





Regression Analysis: ln(ProbMort) versus MortLoan, CommMort

The regression equation is
ln(ProbMort) = 4.15 + 0.000000 MortLoan - 0.0377 CommMort

Predictor	Coef	SE Coef	T	P
Constant	4.151	1.795	2.31	0.030
MortLoan	0.00000009	0.00000004	2.07	0.050
CommMort	-0.03769	0.01902	-1.98	0.060

S = 1.08702 R-Sq = 28.7% R-Sq(adj) = 22.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	2	10.472	5.236	4.43	0.024
Residual Error	22	25.996	1.182		
Total	24	36.468			

Predicted Values for New Observations

New Obs	Fit	SE Fit	95% CI	95% PI
1	1.024	0.236	(0.534, 1.513)	(-1.283, 3.330)

Values of Predictors for New Observations

New Obs	MortLoan	CommMort
1	5000000	95.0