Statistics 516 - Spring 2002 - Final Exam Solutions *(modified for Spring 2003 Practice)*

Part I:

1) **The errors must be normally distributed, have mean zero, and equal variances at each treatment level, and must be independent.**

2) **The probability of observing a test statistic as extreme as the one observed, or more extreme, if the null hypothesis is true.**

Part II:

1) **H_0: β_{walk}=0 given that the bank clerk speed is also included in the model**
vs. H_A: $\beta_{walk} \neq 0$ given that the bank clerk speed is also included in the model
where β_{walk} is the coefficient for the average walking speed

2) **SSE=951.6389-212.8264= 738.8125 df=35-3=32 MSE=738.8125/32= 23.0879**

3)**Chattanooga has the largest DFITTs (0.9755), we compare this to 2sqrt((m+1)/n)=2sqrt((3+1)/36)=2/3 and see that it would have a significant effect on the model.**

4) **The model with bank and walk has Cp < k+1, has the fewest variables of any such model, and has the highest adjusted R^2**

5) $y_{ijk} = \mu_{base} + \alpha_i + \gamma_j + (\alpha\gamma)_{ij} + \varepsilon_{ijk}$

y_{ijk} = the k^{th} observation in specialty i and city j
μ_{base} = the baseline mean
α_i = the main effect due to specialty i
γ_j = the main effect due to city j
$(\alpha\gamma)_{ij}$ = the interaction due to specialty i and city j
ε_{ijk} = the error for the k^{th} observation in specialty i and city j

6) **The treatment effects for Pediatrics and Diabetes & Hypertension are equal.** ($\gamma_{Ped} = \gamma_{DnH}$)

7) **The interaction between specialty and city is not significant (p-value=0.9877)**

8) **Modified Levene Test or Brown and Forsythe Test**

9) **No significant differance (p-value=0.5368).**

10) **There is a significant effect (p-value=0.0467) and the estimated average change is -0.0364 for each additional year.**

11) **R^2 = 0.3429 so 34.29%**

12) **No. The p-value for the interaction is 0.0287.**

13) **Yes. We fail to reject the null hypothesis that it is appropriate with a p-value of 0.6714 from the Hosmer and Lemeshow Goodness-of-Fit test.**

14) **Yes. We reject the null hypothesis that they are not related with a p-value of 0.0006 from the Likelihood Ratio = Deviance test.**

15) $$P[survive = 1] = \frac{1}{1+e^{-(59.2919-0.3677(200))}} = \text{approximately } 0$$

(notice that the slope is negative!)

16) **We are extrapolating.**